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1230 Vienna/Austria**Branch Offices:**
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Court / - Number:
Vienna / FN 288476 f**Bank Details:**
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BIC BKAUATWWVAT ATU63240488
DVR 3002476

TEST REPORT

of the accredited test laboratory

TÜV Nr.: 2023-IN-AT-TICL-E-EX-0-000131-FG-002-Rev3

Applicant: YUNEX GmbH
Otto-Hahn-Ring 6
D-81739 München

Tested Product: ITS On Board Unit 'OBU2X'
Test report for C-V2X part only

FCC ID 2BGULOB2X

IC ID Not decided yet

Manufacturer: Yunex LLC
9225 Bee Cave Road
Austin, TX 78733

Output power 47,9 mW (16,8 dBm) cond. **power supply:** 12 - 24 VDC
229 mW (23,6dBm) EIRP

Frequency range: 5915 MHz **Channel separation:** N/A

Accredited Standards: ANSI C63.26-2015,
RSS-252 Issue 2, Oct 2023

Other standards: FCC: DA 23-343 (24.04.2023), DA 23-1048 (03.11.2023)
Draft 1 RSS-252 Issue 2, 17.05.2023

TÜV AUSTRIA GMBH
Test laboratory for EMC

Ing. Andreas Malek

examined by / Testing
Laboratory
TÜV AUSTRIA GMBH

09.09.2024

Ing. Michael Emminger

approved by / Testing
Laboratory
TÜV AUSTRIA GMBH

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The results of this test report only refer to the provided equipment.

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1. Applicant

Company: YUNEX GmbH

Department: ---

Address: Otto-Hahn-Ring 6; D- 81739 München

Contact person: Mr. Thomas Jatschka

EUT received on: 19.06.2023

Tests were performed on: 19.06.2023 till 20.06.2023

2. Description of EUT

EUT: ITS On Board Unit 'OBU2X'

Manufacturer: Yunex LLC
9225 Bee Cave Road
Austin, TX 78733

Description: YUNEX GmbH provided the following configuration for the measurements:

Prototype

Operating mode: The measurements were carried out at the following running states:
Transmitting C-V2X (see page 6)

Technical data EUT: Rated voltage: 12 – 24 VDC
Rated current: max 1,5A
Rated frequency: DC

Mains voltage during the tests: 24VDC

Climatic conditions in the emc laboratory: Relative humidity: 58%
Temperature: 23°C

3. Standards / Final result

Name	Title	Deviation	Result
FCC: DA 23-343 24.04.2023	ORDER in the matter of Request for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology	none	OK
FCC: DA 23-1048 03.11.2023	Re: Request for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to- Everything Technology, ET Docket No. 19-138	none	OK
RSS-252 Issue 2, Draft 1, 17.05.2023	Intelligent Transportation Systems (ITS) On-Board Units (OBUs) in the 5895 – 5925 MHz Band	none	OK
RSS-252 Issue 2, Oct 2023	Intelligent Transportation Systems' (ITS) On-Board Units (OBUs) in the 5895-5925 MHz Band	none	OK
ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	Methods of measurement only	
Result: Opinions and interpretation of testing laboratory OK: EUT passed NOK: EUT failed			

4. TEST RESULTS

This is a combined test report for FCC requirements and ISED requirements.

FCC:

At first, tests were performed according to FCC waiver DA 23-343. The test report was later updated with FCC waiver DA 23-1048 requirements for Yunex LLC.

ISED:

At first, tests were performed according to RSS-252 Issue 2, Draft 1. The test report was later updated to RSS-252 Issue 2 requirements.

4.1. TEST OBJECT DATA

General EUT Description

This On Board Unit for C-V2X Operation contains various transmitter parts:
C-V2X at 5915 MHz center frequency with 20 MHz channel bandwidth (this test report)
Bluetooth/BLE see test report 2023-IN-AT-TICL-E-EX-0-000131-FG-001 and
an LTE module FCC-ID: RI7ME910G1W3
For simultaneous transmission tests of all three radios and Part 15B compliance see test report
2023-IN-AT-TICL-E-EX-0-000131-FG-003.

2.1033 (c) Technical description

2.1033 (4) Type of emission: 18M0W7D – only one channel

2.1033 (5) Frequency range: 5915 MHz (channel center frequency).

2.1033 (6) Power range and Controls: The maximum average output power is 47,9 mW conducted and there is no power regulation.

2.1033 (7) Maximum output power rating: 47,9 mW conducted; 229 mW EIRP.

2.1033 (8) DC Voltage and Current: 12V – 24V DC
maximum current consumption: 1,5A

RSS-135 This standard does not apply to:

- 1.1.(a) a receiver that scans radio frequencies for the purpose of enabling its associated transmitter to avoid transmitting in an occupied frequency but which does not have the capability of decoding the message (e.g. converting it to audio voice) contained in the radio signal

Worst case Spurious Emissions: -44,4 dBm at 11,824225 GHz EIRP and
-61,53 dBm at 11,818756 GHz conducted

Tests were performed June 19th till June 20th 2023.

4.2. Transmitter Output Power

FCC, § 23 (DA 23-343)
FCC, DA 23-1048

Test conditions	Transmitter power (dBm)
	5915 MHz
Transmitter output power (conducted)	16,8
Transmitter EIRP	23,6
Measurement uncertainty	$\pm 0,75$ dB (conducted) ± 2 dB (radiated)

Firmware power setting: +18

LIMIT § 23 (DA 23-343)

C-V2X OBU and RSU Operations

Frequency Range	Channel Bandwidth	OBU Limits	RSU EIRP Limit
5905-5925 MHz	20 MHz	20 dBm Transmitter Output Power 33 dBm EIRP*; 27dBm EIRP within 5 degrees of horizontal	33 dBm EIRP

*EIRP (equivalent isotropically radiated power)

LIMIT DA 23-1048

C-V2X OBU and RSU Operations

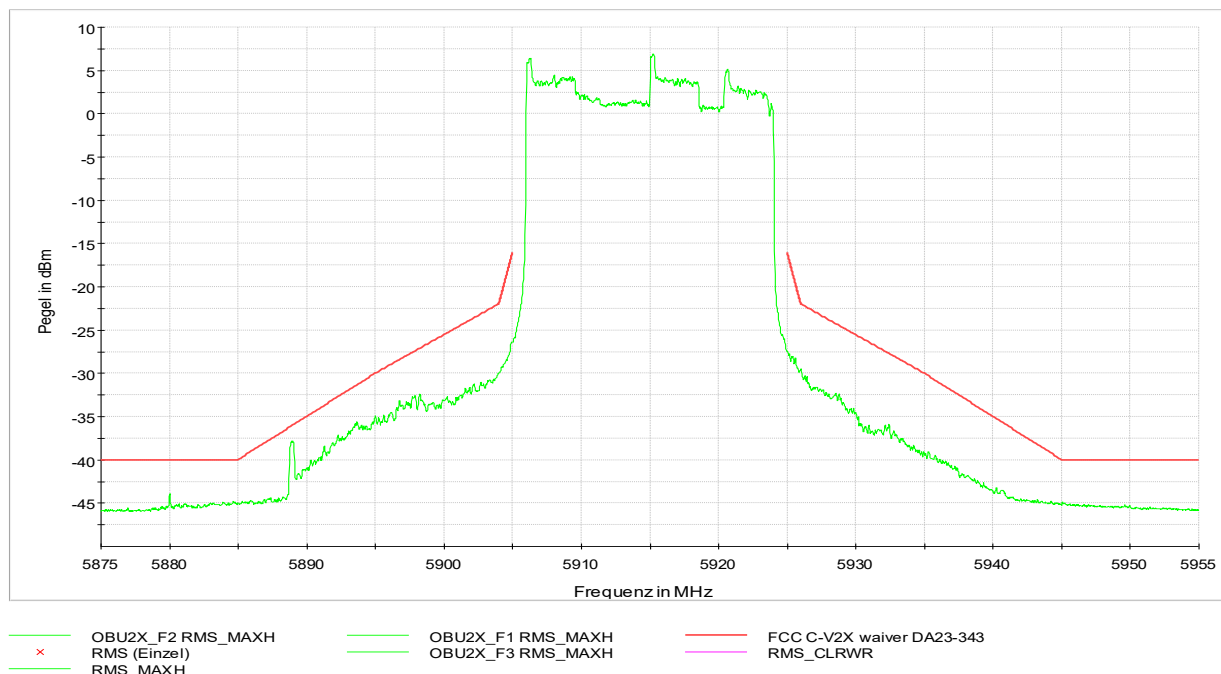
Frequency Range	Channel Bandwidth	OBU Limits	RSU EIRP Limit
5905-5925 MHz	20 MHz	33 dBm EIRP*; 27dBm EIRP within 5 degrees of horizontal	33 dBm EIRP

*EIRP (equivalent isotropically radiated power)

Test Equipment used: EMV-205; NT-100; NT-139; NT-207/1

4.3 Frequency band, Channel Bandwidth and Out of band Emissions

FCC, § 23 (DA 23-343)
FCC, DA 23-1048



Frequency Range: 5905-5925 MHz: PASS

Channel Bandwidth: 20 MHz: PASS, 18 MHz in use

LIMIT § 23 (DA 23-343)

C-V2X OBU and RSU Operations

Frequency Range	Channel Bandwidth	OBU Limits	RSU EIRP Limit
5905-5925 MHz	20 MHz	20 dBm Transmitter Output Power 33 dBm EIRP*; 27dBm EIRP within 5 degrees of horizontal	33 dBm EIRP

*EIRP (equivalent isotropically radiated power)

LIMIT DA 23-1048

C-V2X OBU and RSU Operations

Frequency Range	Channel Bandwidth	OBU Limits	RSU EIRP Limit
5905-5925 MHz	20 MHz	33 dBm EIRP*; 27dBm EIRP within 5 degrees of horizontal	33 dBm EIRP

*EIRP (equivalent isotropically radiated power)

LIMIT **FCC, § 23 (DA 23-343) and DA 23-1048**

C-V2X Out-of-Band Emissions (OOBE) Limits

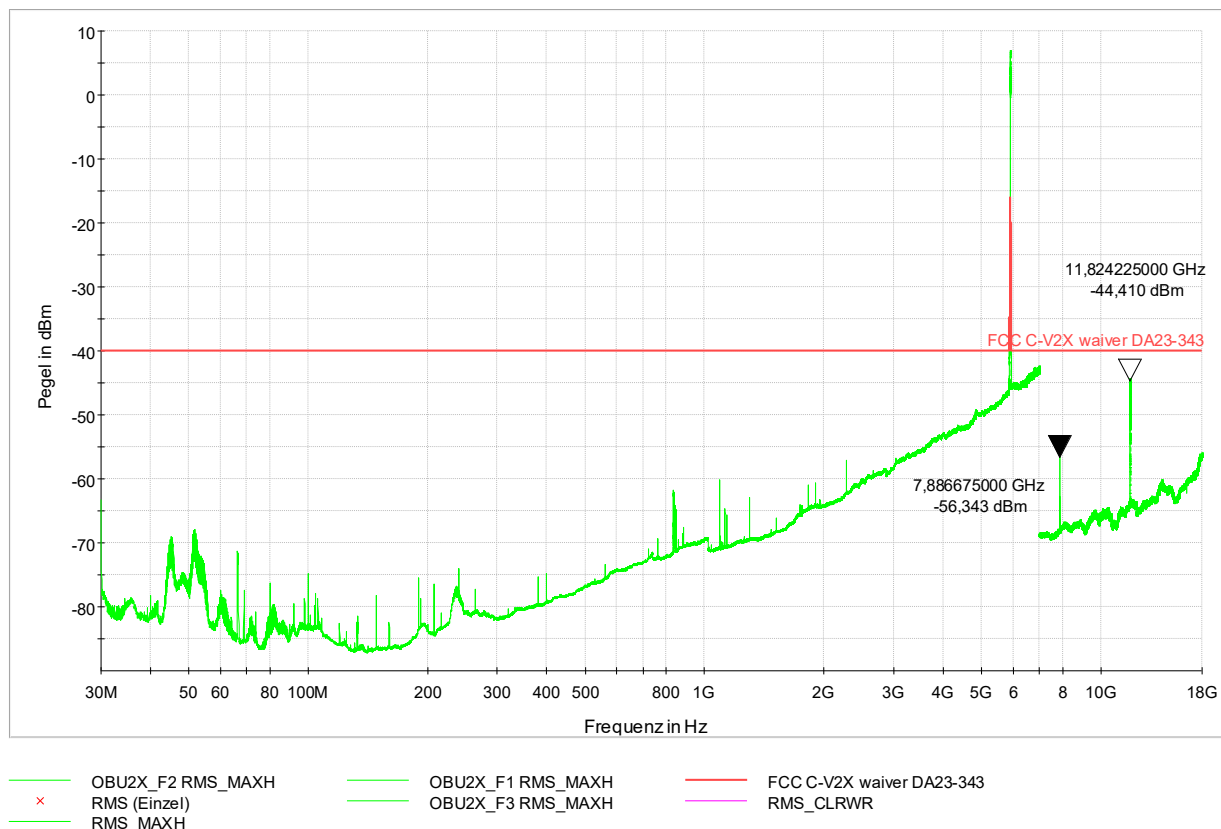
Frequency Offset (MHz from Channel Edge)	OOBE EIRP Limits for C-V2X Transmissions (dBm/100 kHz)**
0.0	-16.0
1.0	-22.0
10.0	-30.0
20.0	-40.0

**See IEEE 802.11p-2010 Table I.8

Test Equipment used: NT-100; NT-139; NT-207/1

4.4 Out of band Emissions – Spurious Emissions

FCC, § 23 (DA 23-343)
FCC, DA 23-1048



The emission at 5,9 GHz is the C-V2X intended transmission for which the displayed limit is not applicable.
Device PASSED the test.

Worst case spurious emissions: -44,4 dBm at 11,824225 GHz

LIMIT § 23 (DA 23-343) and DA 23-1048

C-V2X Out-of-Band Emissions (OOBE) Limits

Frequency Offset (MHz from Channel Edge)	OOBE EIRP Limits for C-V2X Transmissions (dBm/100 kHz)**
0.0	-16.0
1.0	-22.0
10.0	-30.0
20.0	-40.0

**See IEEE 802.11p-2010 Table I.8

Test Equipment used: NT-100; NT-131/1; NT-139; NT-207/1; NT-337/1; NT-456

4.5. Transmitter Power

ISED, § 5.2 (RSS-252)

Test conditions	Transmitter power (dBm)
	5915 MHz
Transmitter EIRP	23,6
Measurement uncertainty	± 0,75 dB

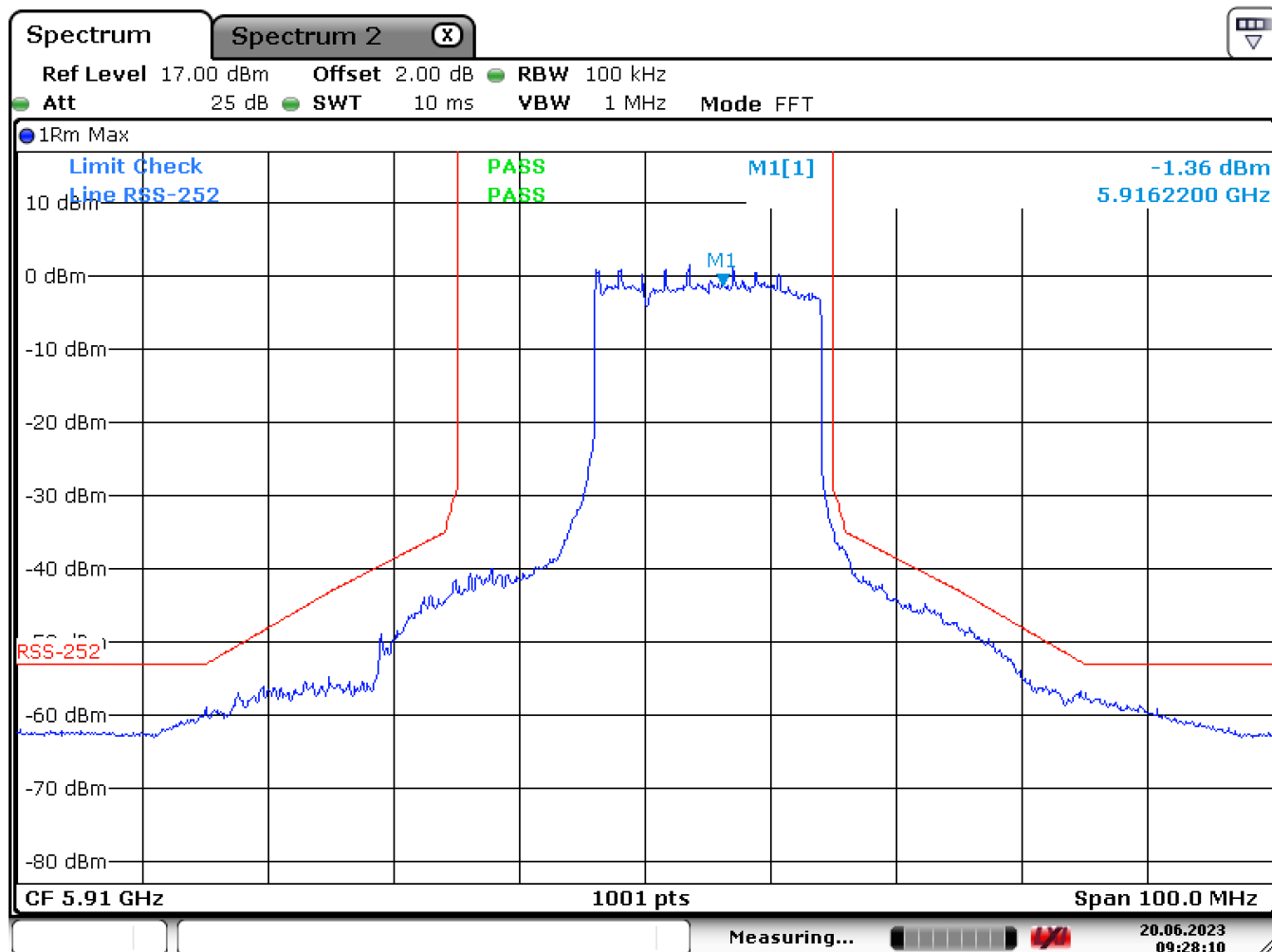
LIMIT § 5.2 (RSS-252)

The average equivalent isotropic radiated power (e.i.r.p.) for C-V2X OBU transmitters shall not exceed 2 W (33 dBm).

Test Equipment used: NT-100; NT-139; NT-207/1

4.6 Unwanted Emissions

ISED, § 5.3 (RSS-252)



Date: 20.JUN.2023 09:28:11

LIMIT § 5.3 (RSS-252)

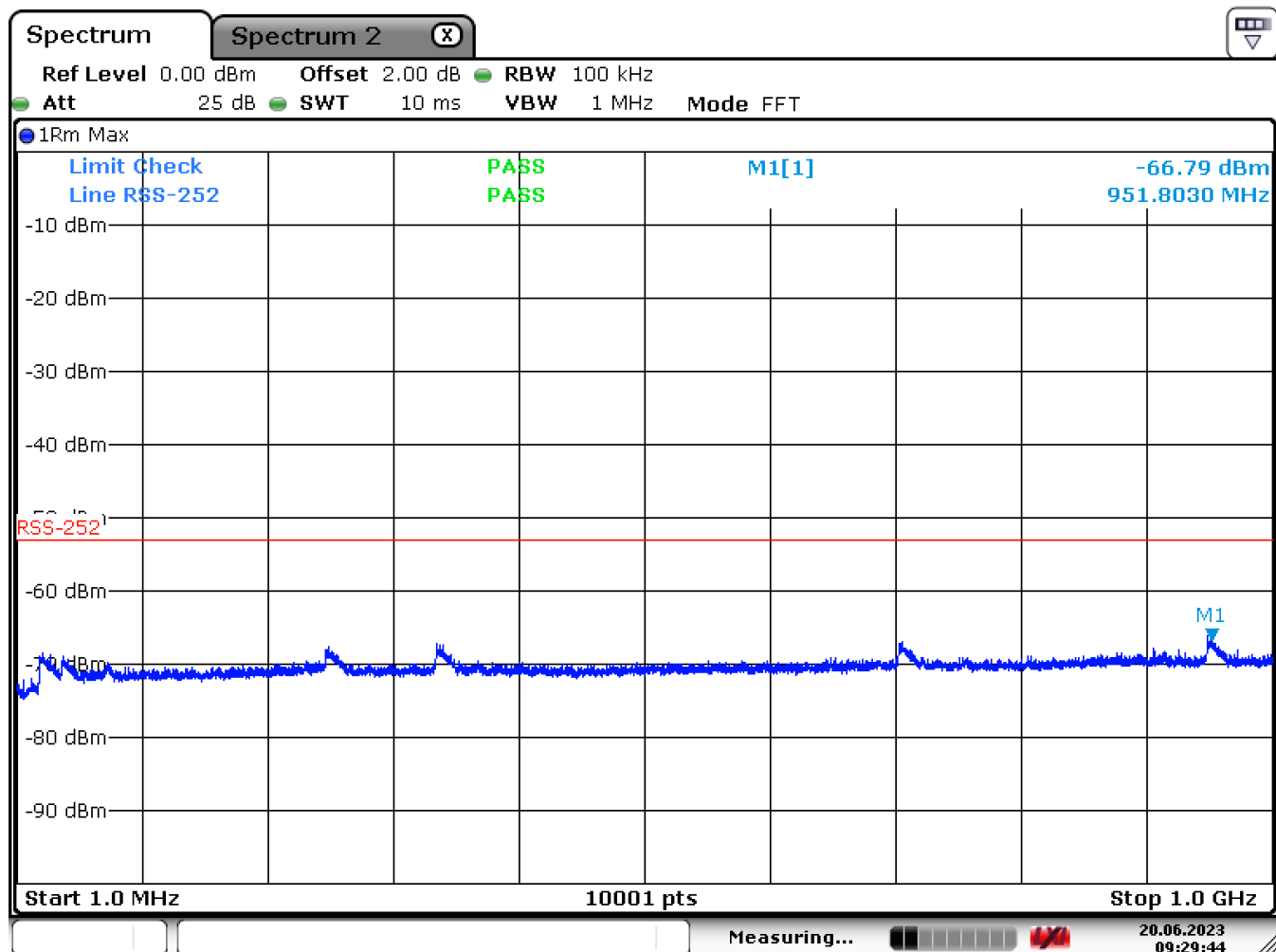
Average conducted power measured at the antenna input shall not exceed:

- a) -29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- b) -35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- c) -43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- d) -53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 1 MHz – 1 GHz



Date: 20.JUN.2023 09:29:44

LIMIT § 5.3 (RSS-252)

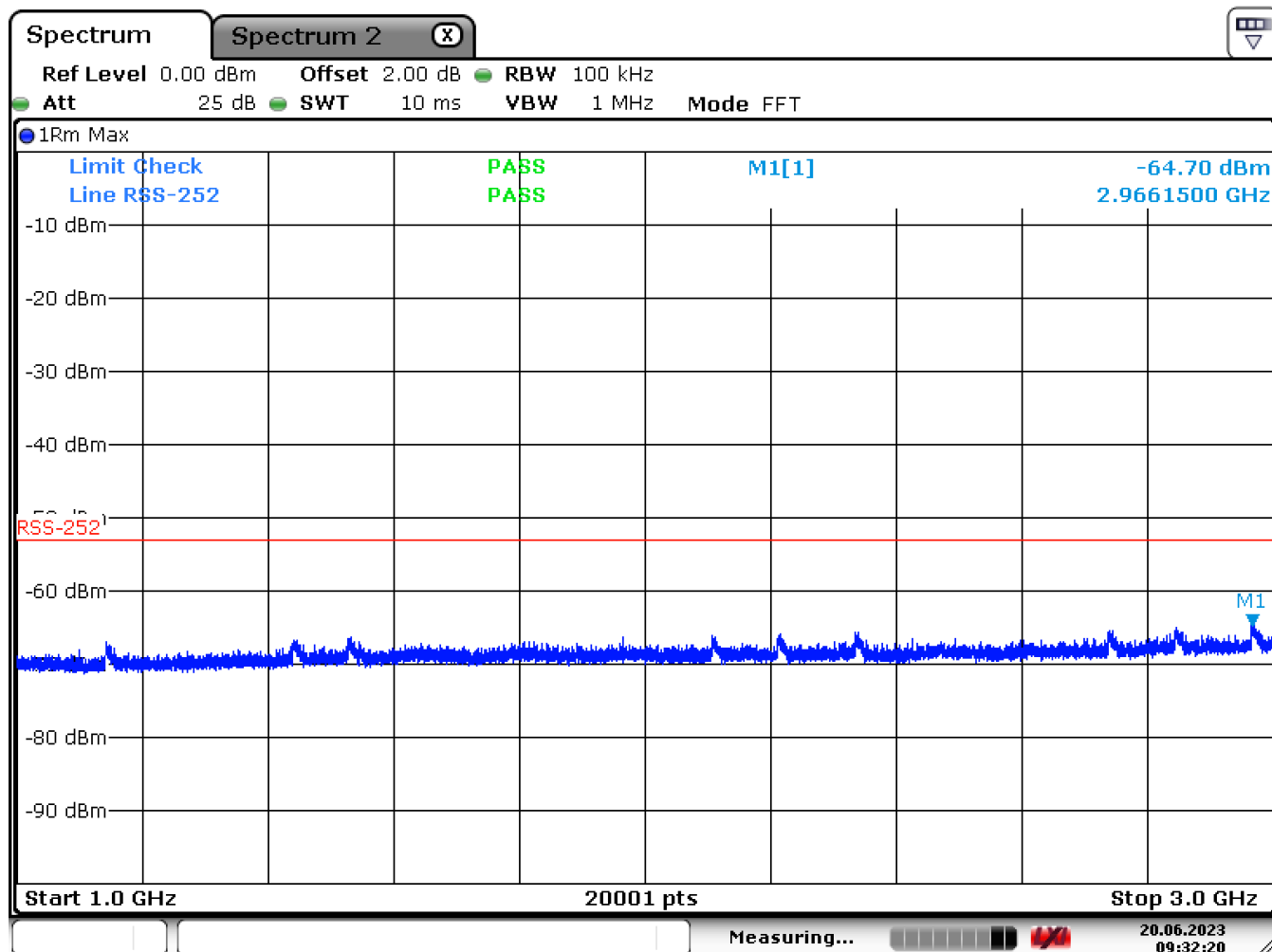
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 1 – 3 GHz



Date: 20.JUN.2023 09:32:20

LIMIT § 5.3 (RSS-252)

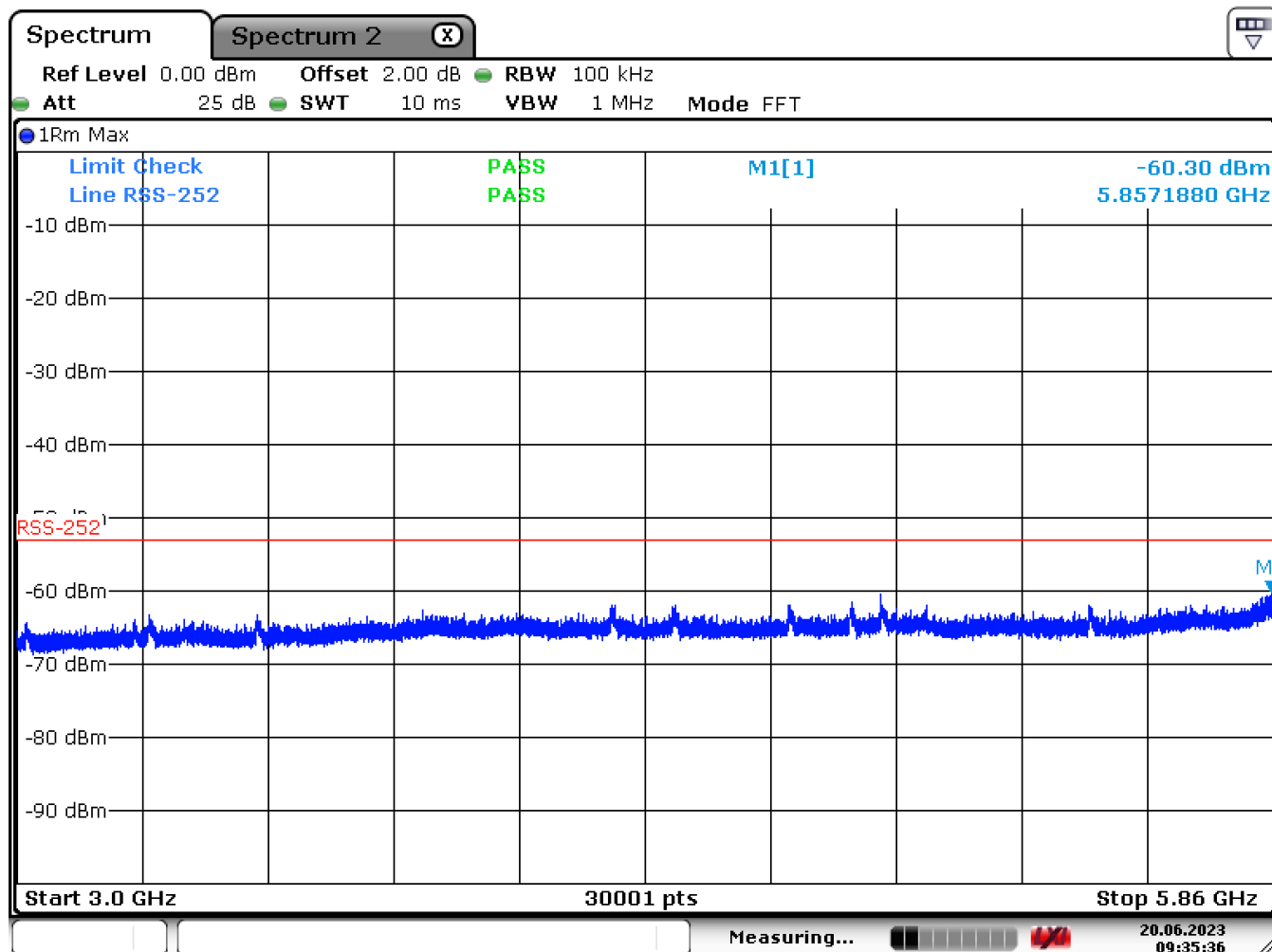
Average conducted power measured at the antenna input shall not exceed:

- a) -29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- b) -35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- c) -43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- d) -53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 3 – 5,86 GHz



Date: 20.JUN.2023 09:35:35

LIMIT § 5.3 (RSS-252)

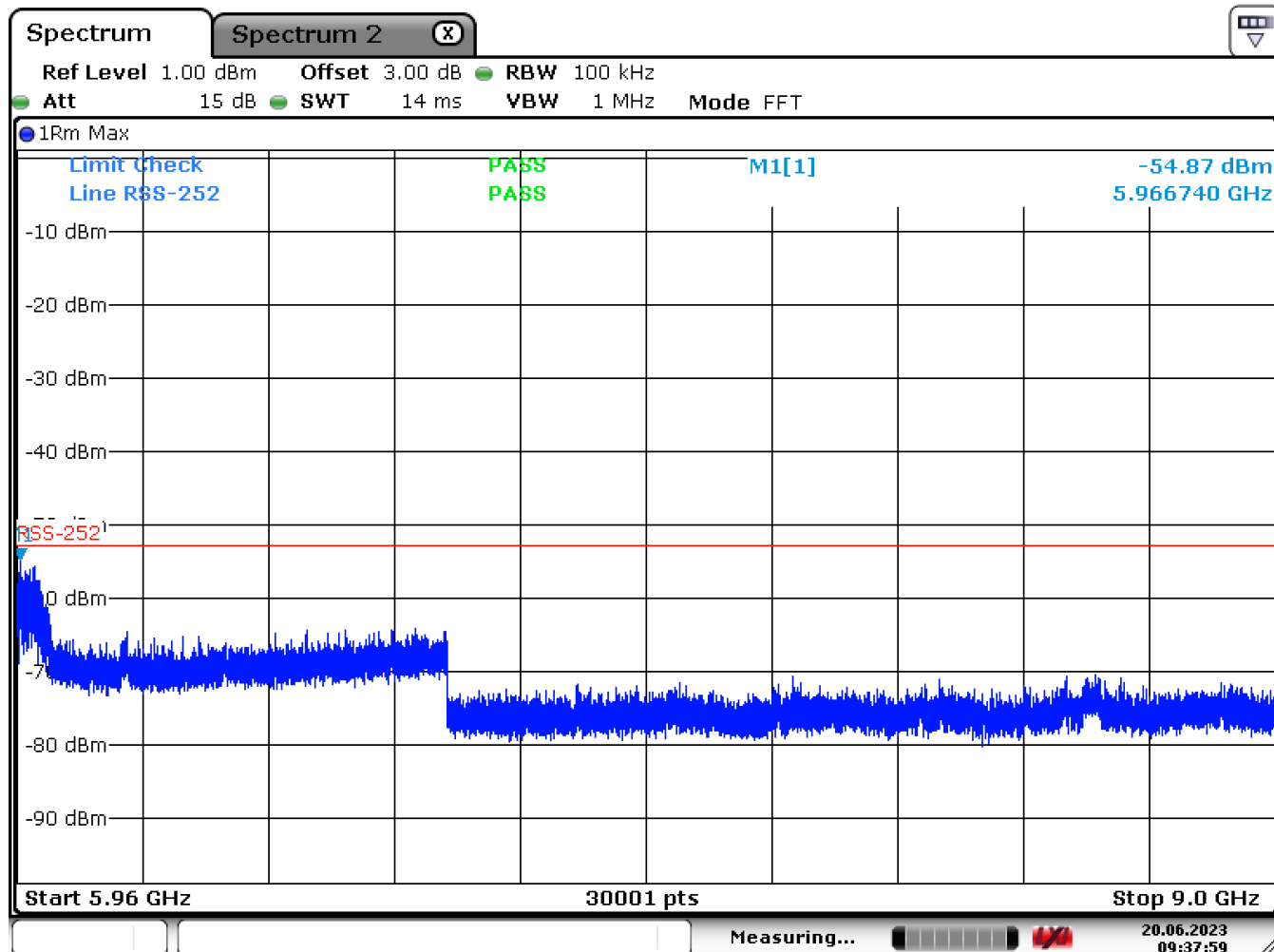
Average conducted power measured at the antenna input shall not exceed:

- a) -29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- b) -35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- c) -43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- d) -53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 5,96 – 9 GHz



Date: 20.JUN.2023 09:37:59

LIMIT § 5.3 (RSS-252)

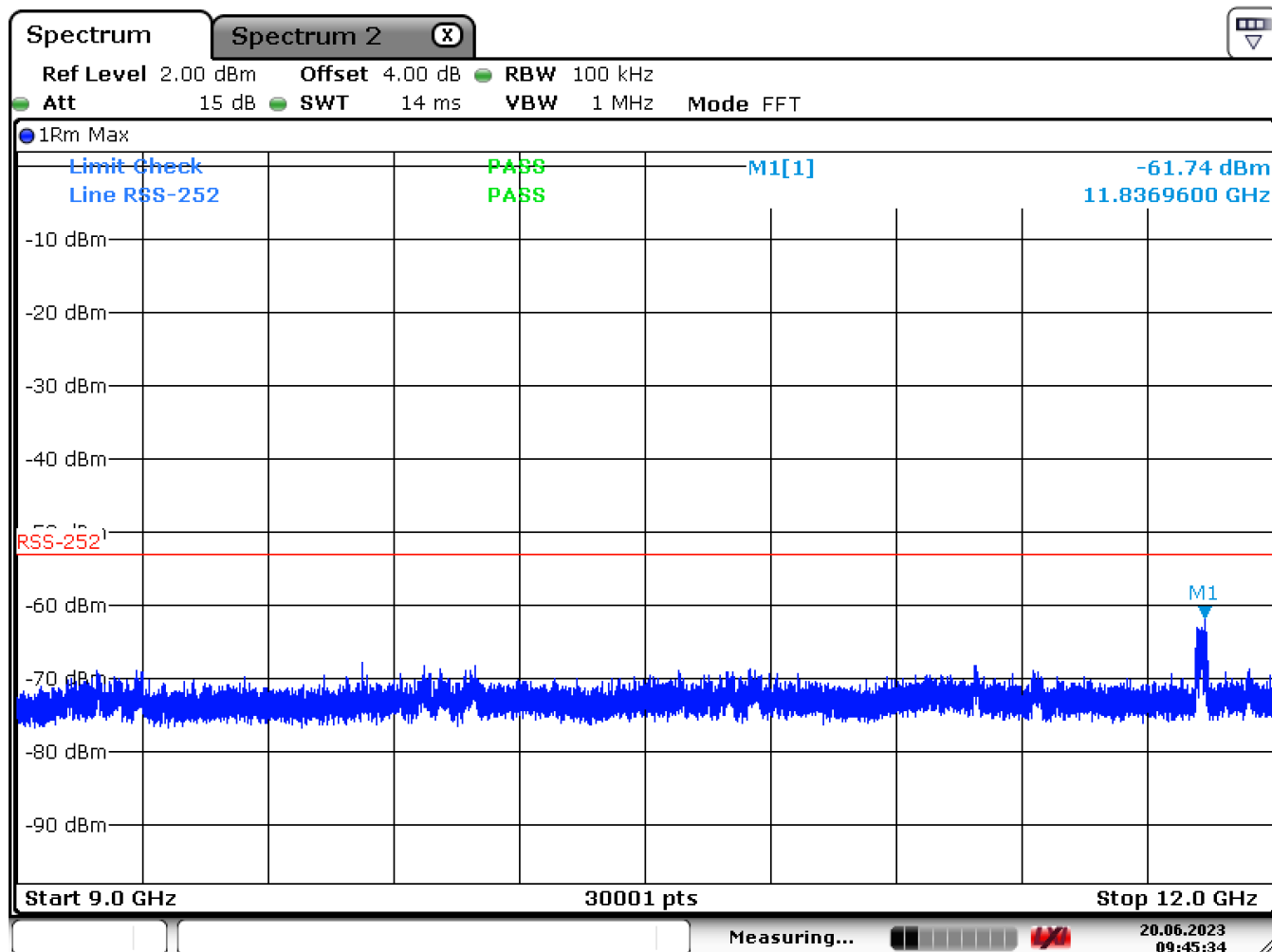
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 9 – 12 GHz



Date: 20.JUN.2023 09:45:34

LIMIT § 5.3 (RSS-252)

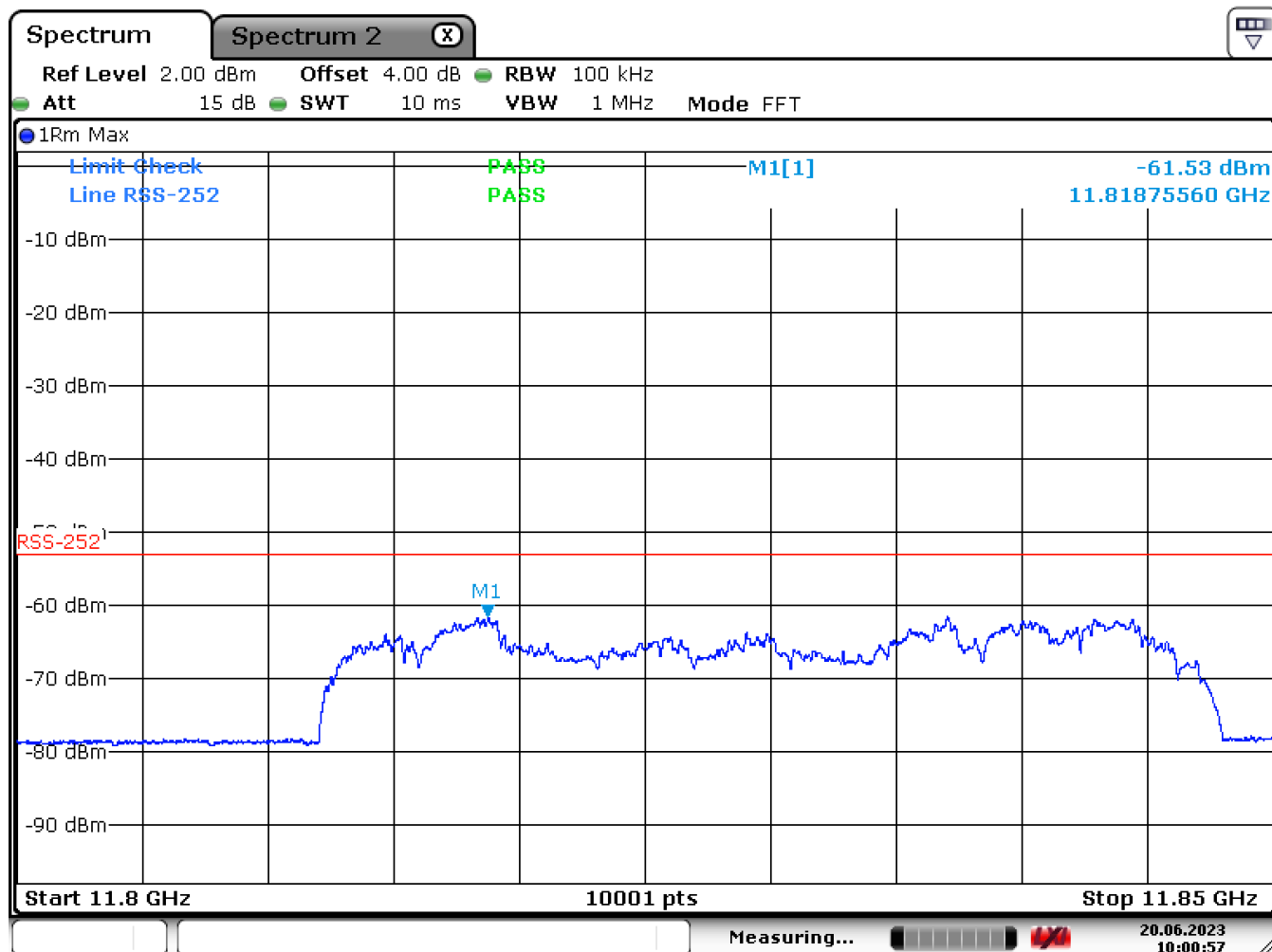
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 11,8 – 11,85 GHz



Date: 20.JUN.2023 10:00:56

LIMIT § 5.3 (RSS-252)

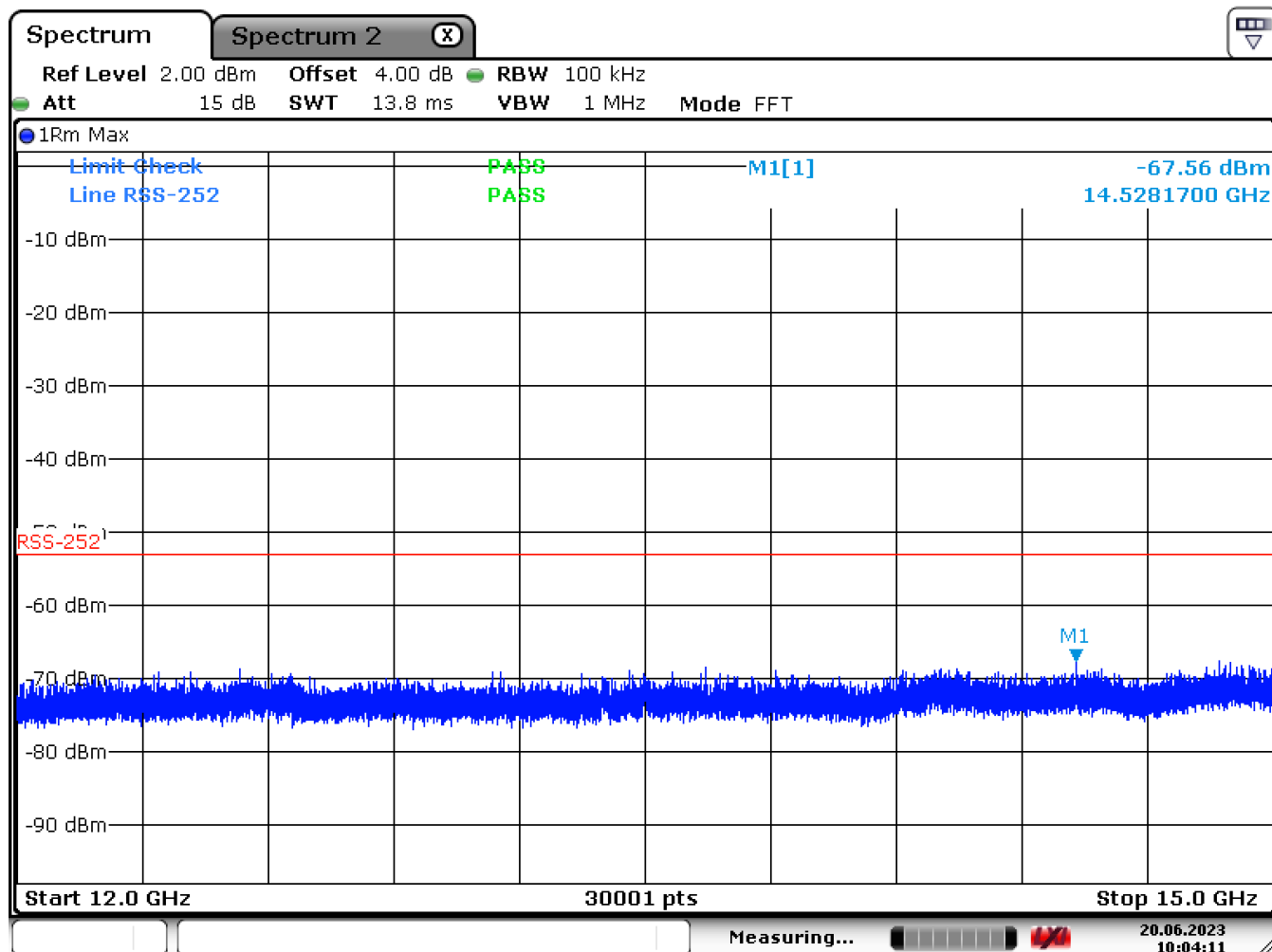
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 12 – 15 GHz



Date: 20.JUN.2023 10:04:11

LIMIT § 5.3 (RSS-252)

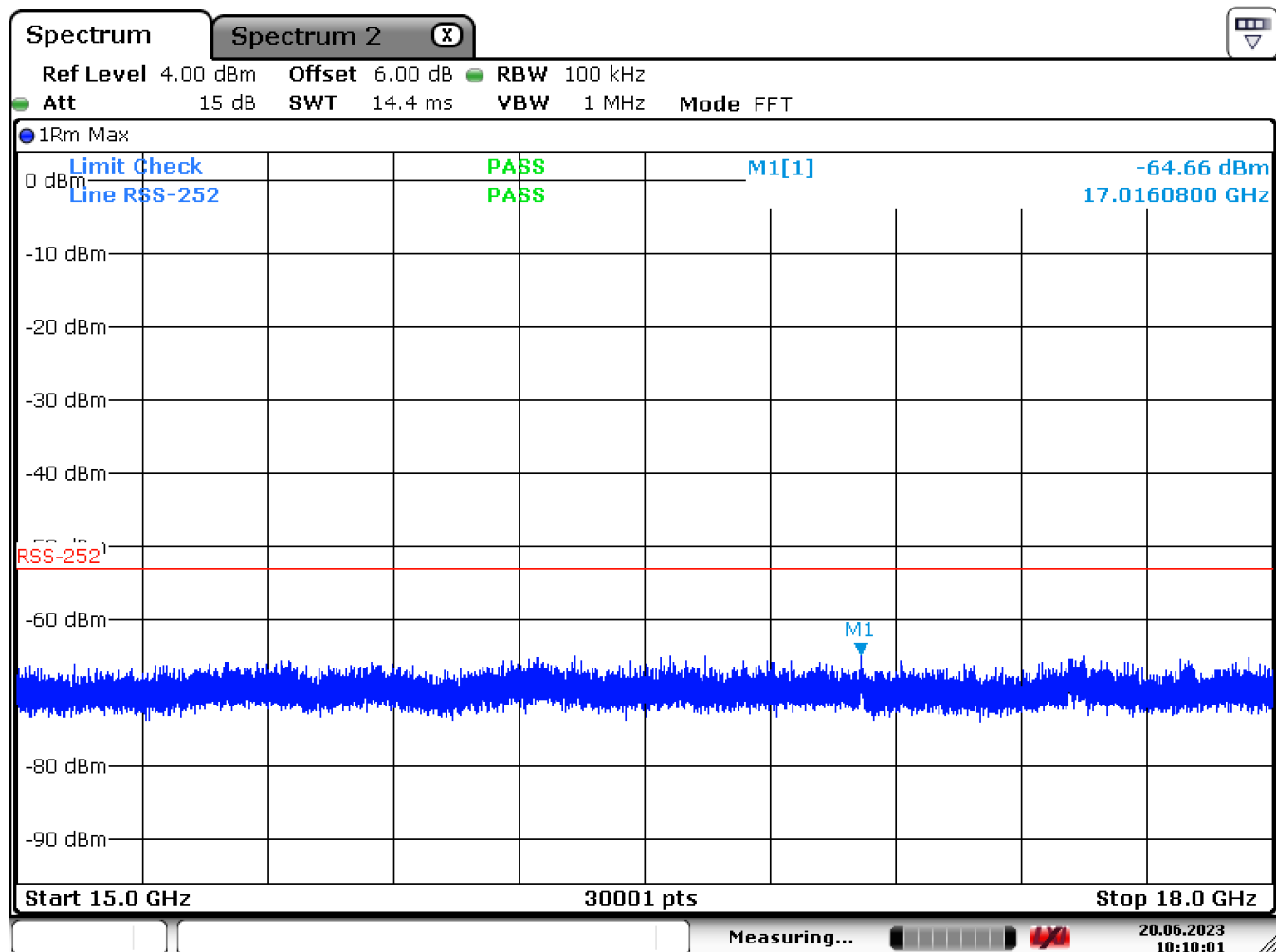
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 15 – 18 GHz



Date: 20.JUN.2023 10:10:02

LIMIT § 5.3 (RSS-252)

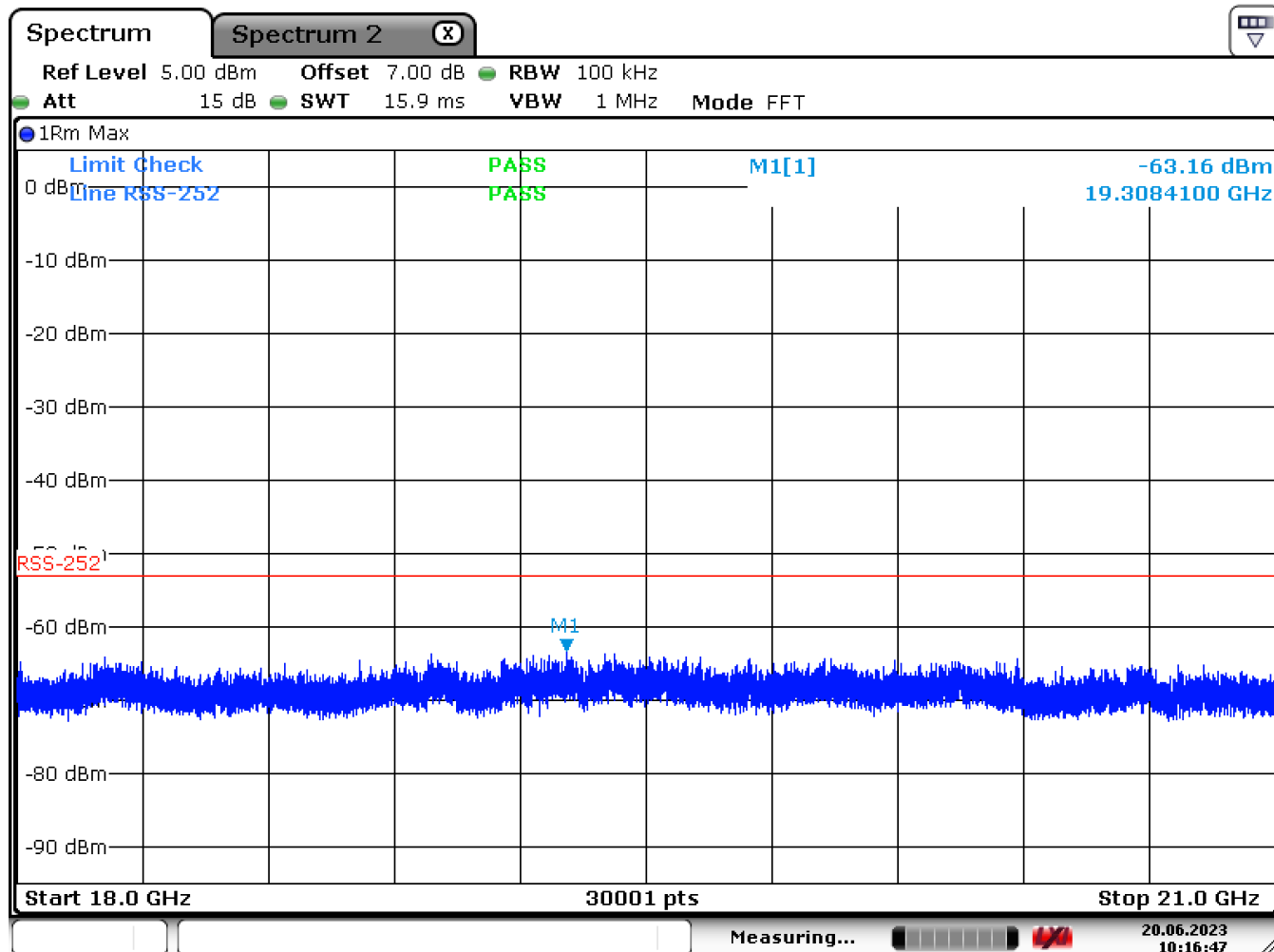
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 18 – 21 GHz



Date: 20.JUN.2023 10:16:47

LIMIT § 5.3 (RSS-252)

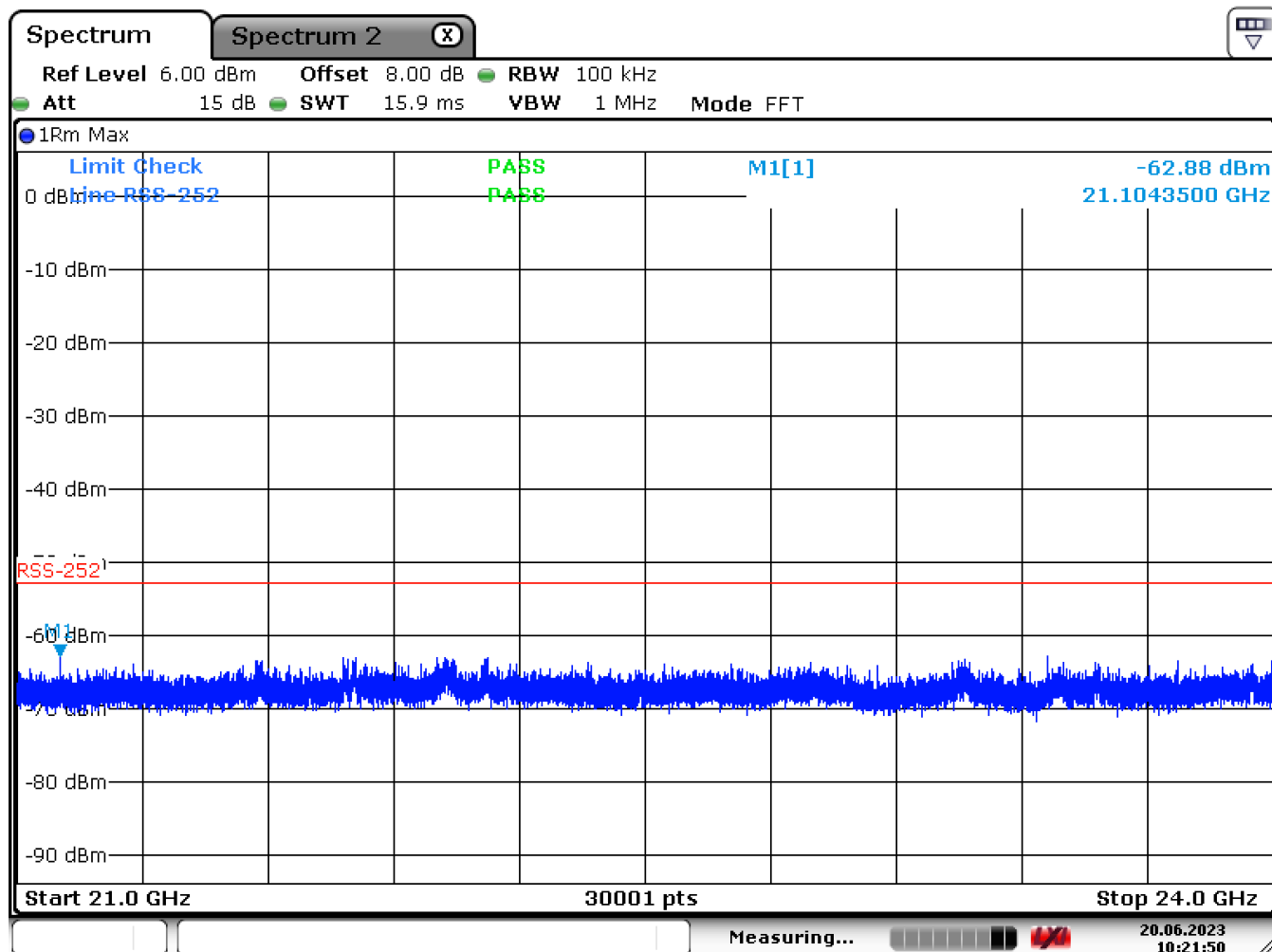
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 21 – 24 GHz



Date: 20.JUN.2023 10:21:50

LIMIT § 5.3 (RSS-252)

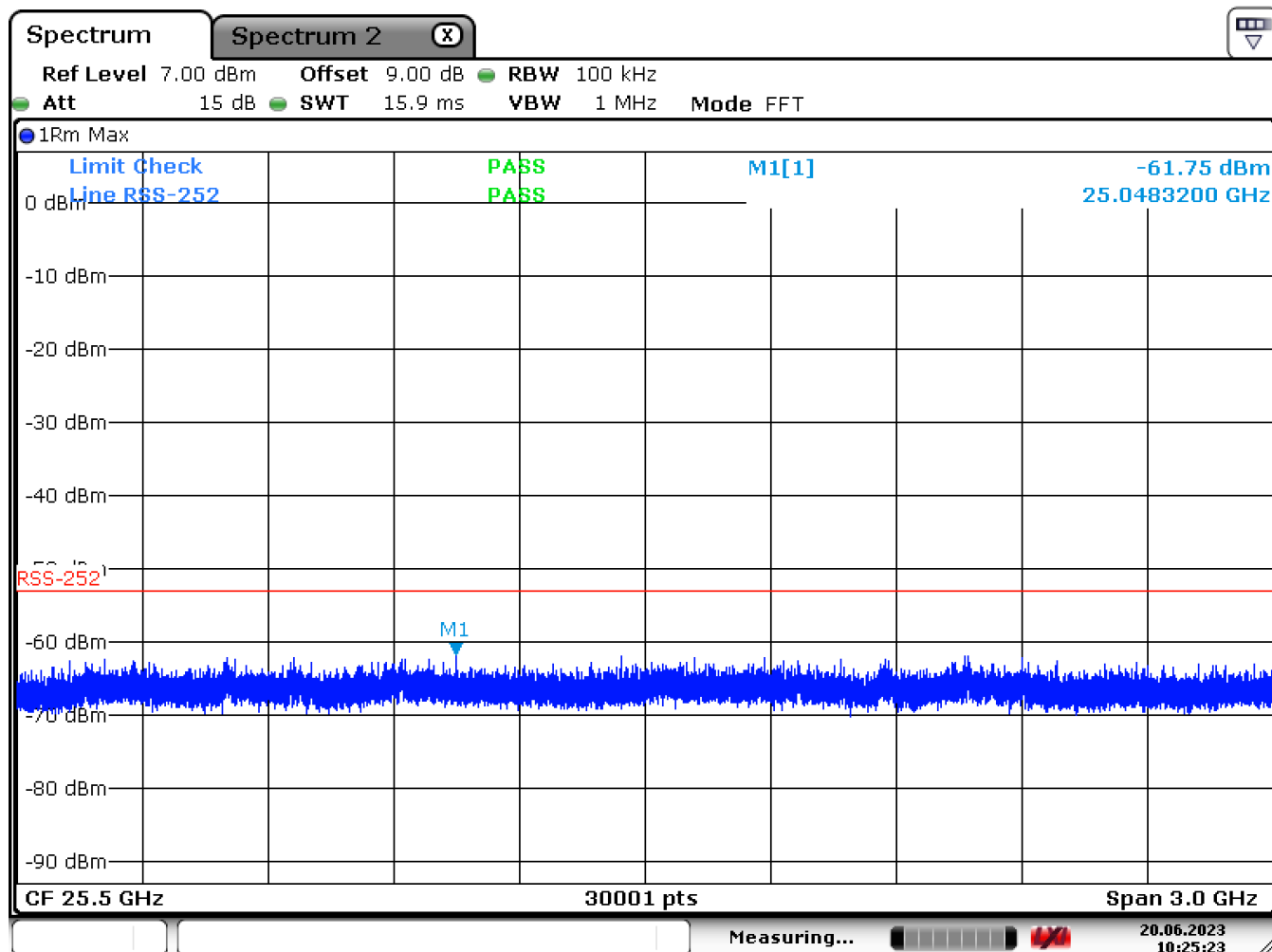
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 24 – 27 GHz



Date: 20.JUN.2023 10:25:23

LIMIT § 5.3 (RSS-252)

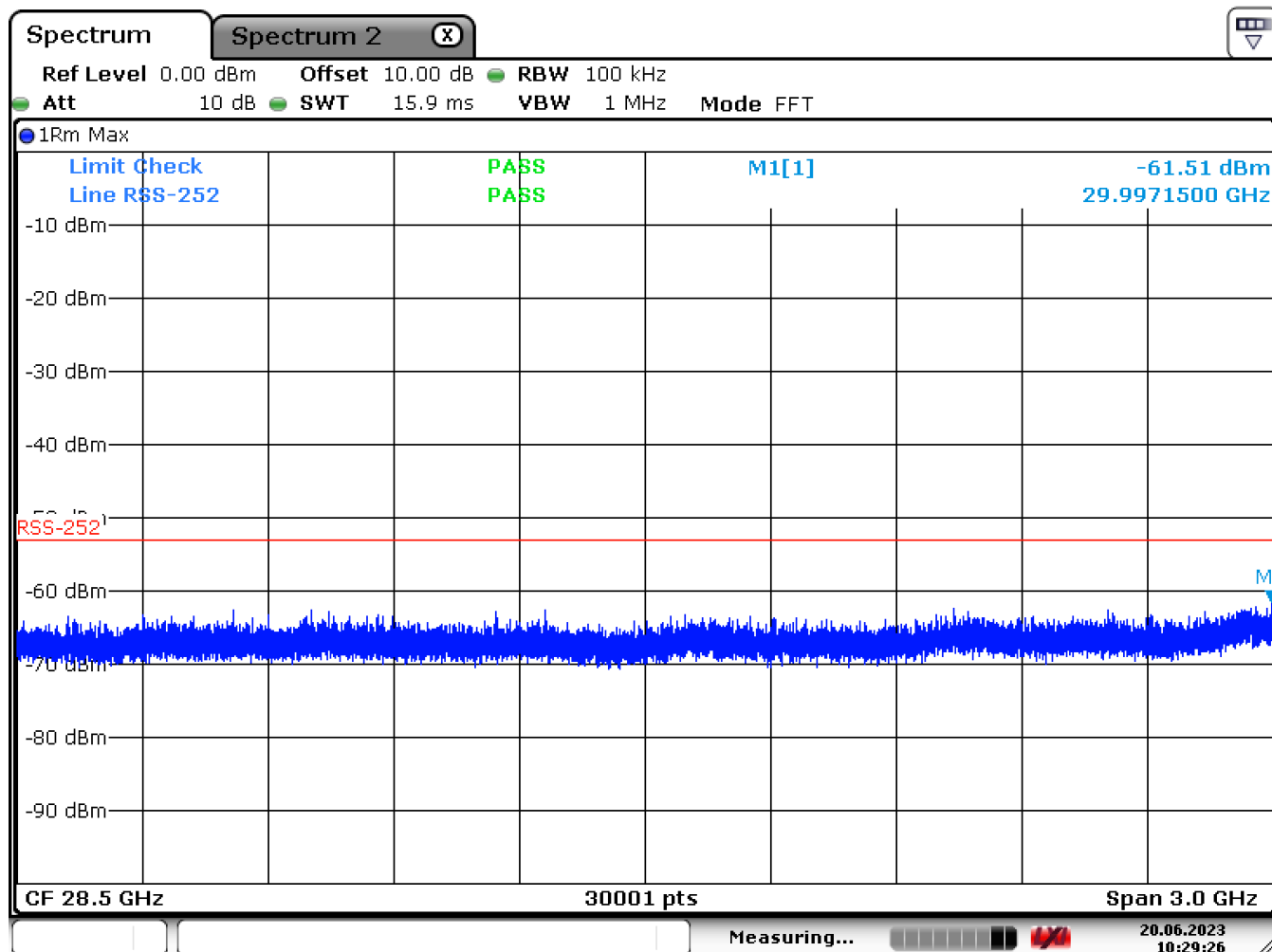
Average conducted power measured at the antenna input shall not exceed:

- a) -29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- b) -35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- c) -43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- d) -53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 27 – 30 GHz



Date: 20.JUN.2023 10:29:27

LIMIT § 5.3 (RSS-252)

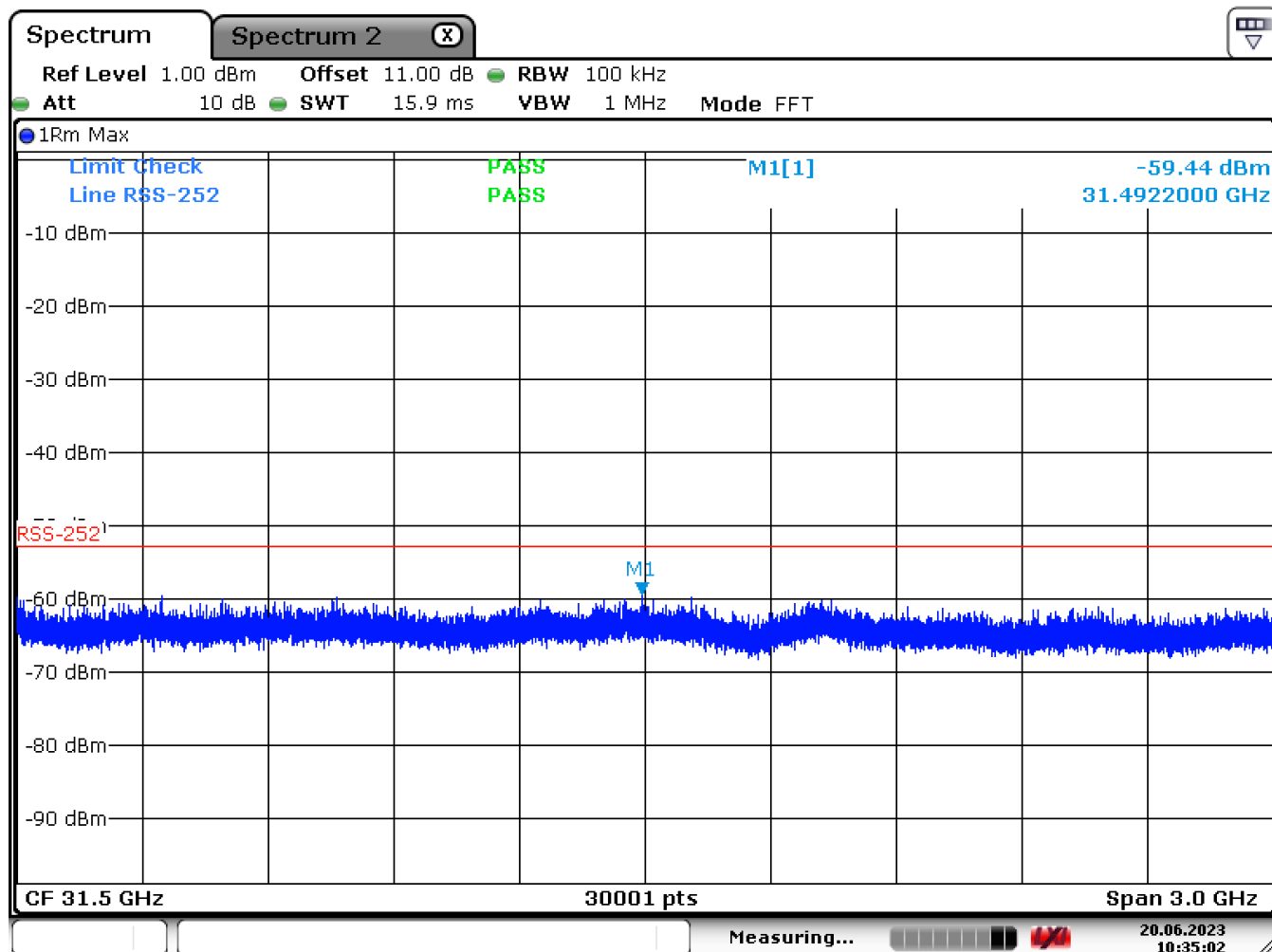
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 30 – 33 GHz



Date: 20.JUN.2023 10:35:03

LIMIT § 5.3 (RSS-252)

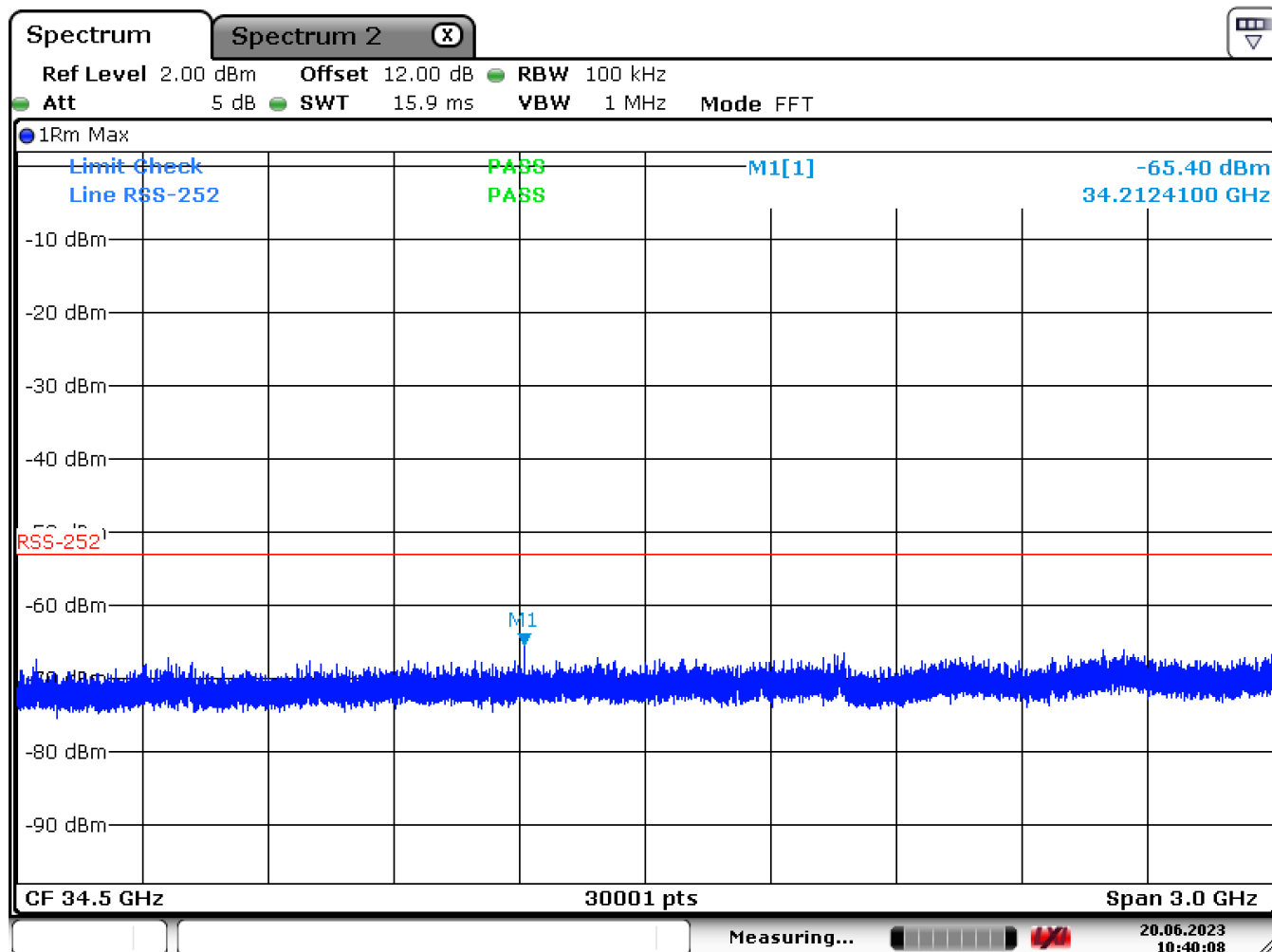
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 33 – 36 GHz



Date: 20.JUN.2023 10:40:08

LIMIT § 5.3 (RSS-252)

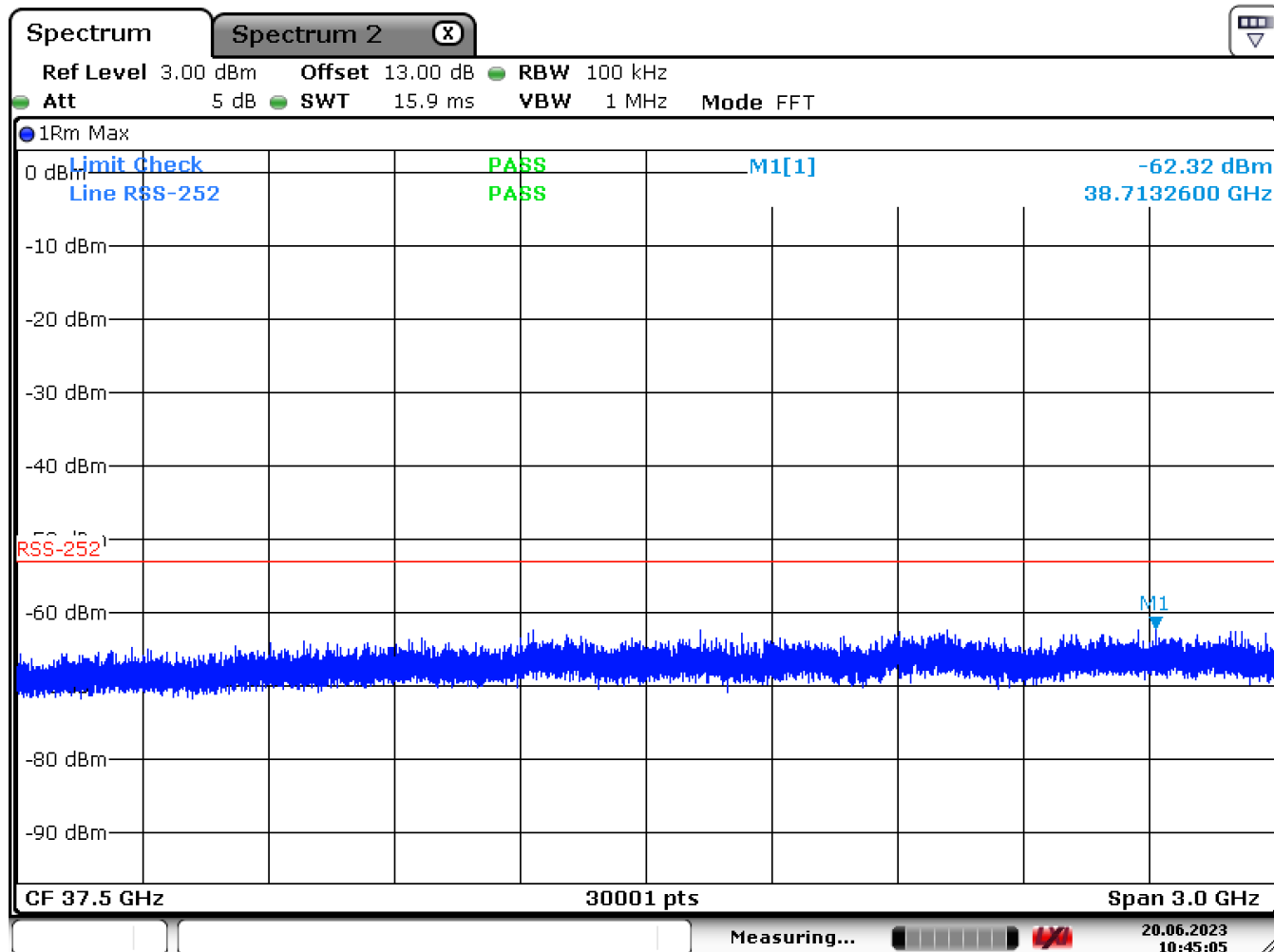
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 36 – 39 GHz



Date: 20.JUN.2023 10:45:05

LIMIT § 5.3 (RSS-252)

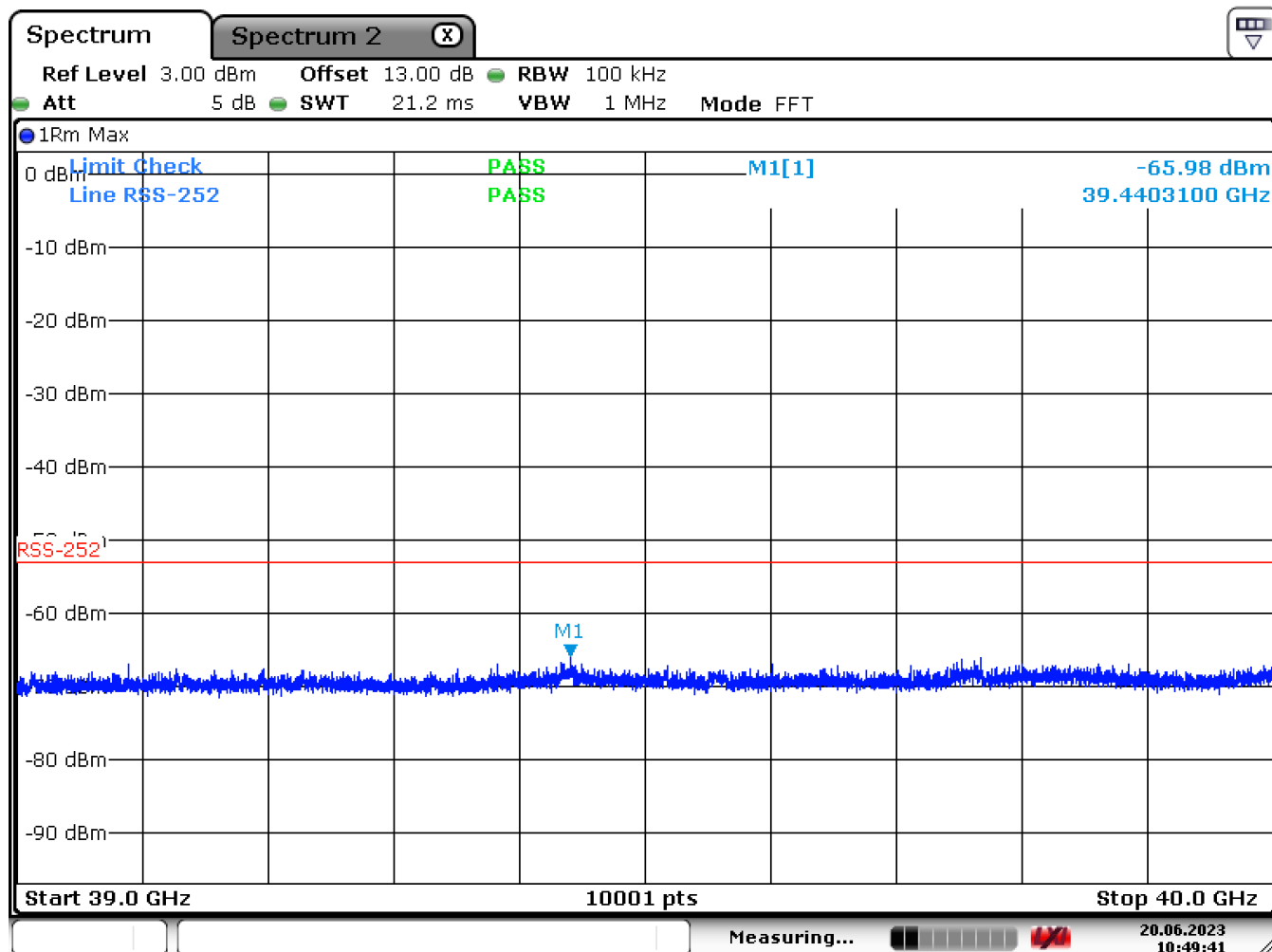
Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Unwanted Emissions ISED, § 5.3 (RSS-252)

Frequency Range 39 – 40 GHz



Date: 20.JUN.2023 10:49:41

LIMIT § 5.3 (RSS-252)

Average conducted power measured at the antenna input shall not exceed:

- 29 dBm/100 kHz at the band edges (5895 MHz and 5925 MHz) up to 1 MHz above or below the band edges;
- 35 dBm/100 kHz at 1 MHz above or below the band edges up to 10 MHz above or below the band edges;
- 43 dBm/100 kHz at 10 MHz above or below the band edges up to 20 MHz above or below the band; and
- 53 dBm/100 kHz at 20 MHz above or below the band edges.

Test Equipment used: EMV-205

Appendix 1

Test equipment used

☐ Anechoic Chamber with 3m measurement distance	NT-100	☐ Ant. tripod for EN61000-4-3 Model TP1000A	NT-156
☐ Stripline according to ISO 11452-5	NT-108	☐ Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
☐ MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐ Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
☐ DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐ ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐ CO3000 Controller Mast+Turntable	NT-112/1	☐ ESR – Test receiver 20 Hz – 26,5 GHz	NT-207/1
☐ HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐ Digital Radio Tester CMW500	NT-208/1
☐ FMZB1513 - Loop Antenna 9 kHz - 30 MHz	NT-122/1	☐ Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
☐ HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐ CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐ Dipole Antenna VHA9103 30 - 300 MHz	NT-124/1a	☐ 3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐ Dipole Antenna UHA9105 300 - 1000 MHz	NT-124/1b	☐ Digital Radio Tester Aeroflex 3920	NT-212/1
☐ 3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	☐ Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐ 3116 - Horn Antenna 18 - 40 GHz	NT-126	☐ RubiSource T&M Timing reference	NT-216
☐ SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	☐ Radiocommunicationanalyzer SWR 1180 MD	NT-217
☐ AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	☐ Mixer FS-Z60 40 GHz – 60 GHz	NT-218/1
☐ HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐ Mixer FS-Z90 60 GHz – 90 GHz	NT-219/1
☐ HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	☐ DSO9104 Digital scope	NT-220/1
☐ 3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	☐ TPS 2014 Digital scope	NT-222
☐ VULB 9163 Trilog Antenna 30 – 3000 MHz	NT-131/1	☐ Artificial Ear according to IEC 60318	NT-224
☐ Loop Antenna H-Field	NT-132	☐ 1 kHz Sound calibrator	NT-225
☐ Horn Antenna 500 MHz - 2900 MHz	NT-133	☐ SRM-3006 Spectrumanalyzer	NT-233/1a
☐ Horn Antenna 500 MHz - 6000 MHz	NT-133/1	☐ E-field probe SRM 75 MHz – 3 GHz	NT-234
☐ Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐ Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-e
☐ Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐ Magnetometer HP-01	NT-241/1
☐ BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	☐ EFA-3 H-field- / E-field probe	NT-243
☐ Conical Dipol Antenna PCD8250	NT-138	☐ EHP-50F H-field- / E-field probe	NT-243/1
☐ HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	☐ Field Meter EMR-200 100 kHz – 3 GHz	NT-244
☐ HZ-1 Antenna tripod	NT-150	☐ E-field probe 100 kHz – 3 GHz	NT-245
☐ BN 1500 Antenna tripod	NT-151	☐ H-field probe 300 kHz – 30 MHz	NT-246

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☐ E-field probe 3 MHz – 18 GHz	NT-247	☐ Prana N-MT 500 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332/1
☐ H-field probe 27 MHz – 1 GHz	NT-248	☐ BBA150 RF-Amplifier 1 GHz - 6 GHz	NT-333/1
☐ ELT-400 1 Hz – 400 kHz	NT-249	☐ APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐ MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	☐ Preamplifier 1 GHz - 4 GHz	NT-335
☐ FCC-203I EM Injection clamp	NT-251	☐ Preamplifier for GPS MKU 152 A	NT-336
☐ FCC-203I-DCN Ferrite decoupling network	NT-252	☐ Preamplifier 1 GHz – 18 GHz	NT-337/1
☐ PR50 Current Probe	NT-253	☐ DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐ i310s Current Probe	NT-254/1	☐ 2-97201 Electronic load	NT-341
☐ Fluke 87 V True RMS Multimeter	NT-260	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐ Model 2000 Digital Multimeter	NT-261	☐ TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐ Fluke 87 V Digital Multimeter	NT-262/1	☐ VDS 200 Mobil-impuls-generator	NT-350
☐ ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	☐ LD 200 Mobil-impuls-generator	NT-351
☐ ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	☐ MPG 200 Mobil-Impuls-Generators	NT-352
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	☐ EFT 200 Mobil-impuls-generator	NT-353
☐ ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	☐ AN 200 S1 Artificial Network	NT-354
☐ EZ10 T-Artificial Network	NT-305	☐ FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
☐ SMG - Signal generator 0,1 - 1000 MHz	NT-310	☐ PHE 4500 - Mains impedance network	NT-401
☐ SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	☐ IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐ RefRad Reference generator	NT-312	☐ TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
☐ SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	☐ ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐ 40 MHz Arbitrary Generator TGA1241	NT-315	☐ CN-EFT1000 - Capacitive clamp (Burst)	NT-411/1
☐ Artificial mains network NSLK 8127-PLC	NT-316	☐ Highpass-Filter 100 MHz – 3 GHz	NT-412
☐ PSURGE 4.1 Surge generator	NT-324	☐ Highpass-Filter 600 MHz – 4 GHz	NT-413
☐ IMU4000 Immunity test system	NT-325/1a-e	☐ Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐ VCS 500-M6 Surge-Generator	NT-326	☐ Highpass-Filter 1800 MHz – 16 GHz	NT-415
☐ Oscillatory Wave Simulator incl. Coupling networks	NT-328a+b+c		
☐ BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330		

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Test equipment used

☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417/1	☐	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	☐	WHKX12-2700-3000-18000 3 GHz Highpass filter	NT-472
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	☐	WHKX10-3870-4500-18000 4,5 GHz Highpass filter	NT-473
☐	RF-Attenuator 30 dB	NT-424	☐	CDN S9 USB3.0 Coupling decoupling network	NT-474
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	☐	CDN S2 XLR3-1 Coupling decoupling network	NT-475
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	☐	CDN S8 RJ45 Coupling decoupling network	NT-476
☐	RF-Attenuator 6 dB	NT-428	☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
☐	WRU 27 - Band blocking 27 MHz	NT-430	☐	Van der Hoofden Test Head	NT-484
☐	WHJ450C9 AA - High pass 450 MHz	NT-431	☐	WRCJV12-5820-5850-5950-5980 5,9 GHz Band Reject Filter	NT-490
☐	WHJ250C9 AA - High pass 250 MHz	NT-432	☐	WHKX10-5670-6300-18000 6 GHz Highpass filter	NT-491
☐	RF-Load 150 W	NT-433	☐	WHK12-935-1000-7000 1 GHz Highpass filter	NT-492
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	☐	EMC Video/Audiosystem	NT-511/1
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	EMC32 Version 10.60.20 Test software	NT-520/1
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	SRM-TS Version 1.3 software for SRM-3000	NT-522
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☐	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Spitzenberger und Spies Test software V4.1	NT-525
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Vertical coupling plane (ESD)	NT-531
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #4 for EN 61000-4-6	NT-553
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #3 for conducted emission	NT-554
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445	☐	Test cable #8 Sucoflex 104EA	NT-559
☐	Tube imitations according to EN 55015	NT-450	☐	Test cable #9 (for outdoor measurements)	NT-580
☐	FCC-801-M3-16A Coupling decoupling network	NT-458	☐	Test cable #10 (for outdoor measurements)	NT-581
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Test cable #13 Sucoflex 104PE	NT-584
☐	FCC-801-M5-25 Coupling decoupling network	NT-460	☐	Test cable #21 for SRM-3000	NT-592
☐	FCC-801-T4 Coupling decoupling network	NT-463	☐	Shield chamber	NT-600
☐	FCC-801-C1 Coupling decoupling network	NT-464	☐	Climatic chamber	M-1200

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Test equipment used

☐	Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	☐	HF- Amplifier 9 kHz-225 MHz BBL200	EMV-300/1
☐	Turntabel 6 m diameter	EMV-101	☐	HF- Amplifier 80 -1000 MHz BBA150	EMV-301
☐	Antenna mast + controller	EMV-102+ EMV-103	☐	HF- Amplifier 0,8 - 6 GHz BBA150	EMV-302
☐	EMC Video/Audiosystem	EMV-104	☐	High Power Ant. 20-200 MHz HPBA-2510	EMV-303/1
☐	EMC Software EMC32 Version 10.60.20	EMV-105	☐	High Power Ant. 20-200 MHz S12018-21	EMV-303/2
☐	Hornantenna 1 – 18 GHz HF 907	EMV-110	☐	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304
☐	Antennapre.amp. 1 – 18 GHz BBV 9718 D	EMV-111/1	☐	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305
☐	Trilog Antenna 30-3000 MHz VULB9163	EMV-112	☐	HF- Amplifier 9 kHz-250 MHz BBA150 (low noise)	EMV-306
☐	Monopol 9 kHz – 30 MHz VAMP 9243	EMV-113	☐	ISO11451-2 TLS 10 kHz – 30 MHz	EMV-307
☐	Antennapre.amp 18 – 40 GHz BBV 9721	EMV-114	☐	Load Dump Generator LD 200N	EMV-350
☐	Hornantenna 200 – 2000 MHz AH-220	EMV-115	☐	Ultra Compact Symulator UCS 200N100	EMV-351
☐	DC Artificial Network PVDC 8300	EMV-150	☐	Automotive Power fail module PFM 200N100.1	EMV-352
☐	AC Artificial Network NNLK 8121 RC	EMV-151	☐	Voltage Drop Symulator VDS 200Q100	EMV-353
☐	AC Artificial Network NNLK 140	EMV- 153a-d	☐	Arb. Generator AutoWave	EMV-354
☐	EMI Receiver ESW44	EMV-200/1	☐	Ultra Compact Symulator UCS 500N7	EMV-355
☐	Signalgenerator 9 kHz – 40 GHz N5173B	EMV-201	☐	Coupling decoupling network CNI 503B7 / 32 A	EMV-356
☐	GPS Frequency normal B-88	EMV-202	☐	Coupling decoupling network CNI 503B7 / 63 A	EMV-357
☐	DC Power supply N5745A	EMV-203	☐	Telecom Surge Generator TSurge 7	EMV-358
☐	Spektrum Analyzator FSV40	EMV-205	☐	Coupling decoupling network CNI 508N2	EMV-359
☐	Thd Multimeter Model 2015	EMV-206	☐	Coupling decoupling network CNV 504N2.2	EMV-360
☐	Poweramplifier PAS15000	EMV- 207/abc	☐	Immunity generator NSG4060/NSG4060-1	EMV-361
☐	Inrush Current Source	EMV- 208/abc	☐	Coupling network CDND M316-2	EMV-362
☐	Arb.-generator Sycore	EMV-209	☐	Coupling network CT419-5	EMV-363
☐	Harmonics/Flicker analyzer ARS 16/3	EMV-210	☐	ESD Generator NSG 437	EMV-364
☐	Power Supply Regatron AC	EMV-214	☐	Pulse Limiter VTSD 9561-F BNC	EMV-405
☐	Power Supply Regatron DC	EMV-215	☐	Transient emission BSM200N40+BS200N100	EMV- 450+451
☐	Harmonics/Flicker analyser Zimmer	EMV-216	☐	Cap. Coupling Clamp HFK	EMV-455
☐	Flicker Impedanz Newtons4th 753	EMV-218	☐	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458
☐	Comemso	EMV-219			

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☐	Coupling network CDN M2-100A	EMV-459
☐	Coupling network CDN M3-32A	EMV-460
☐	Coupling network CDN M5-100A	EMV-461
☐	Current Clamp CIP 9136A	EMV-462
☐	DC Artificial Network HV-AN 150	EMV-464+465
☐	Coupling Clamp EM 101	EMV-466
☐	Decoupling Clamp FTC 101	EMV-467
☐	Power attenuator 10 dB / 250 Watt	EMV-469/2
☐	HV AMN NNHV 8123 800A	EMV-472
☐	HV AMN NNHV 8123 800A	EMV-473

Appendix 2 Photodocumentation

Division:
Industry & Energy

Description: Front view

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Division:
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Description: Rear view

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Appendix 2 Photodocumentation

Division:
Industry & Energy

Description: Battery compartment opened

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Division:
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Description: Case opened

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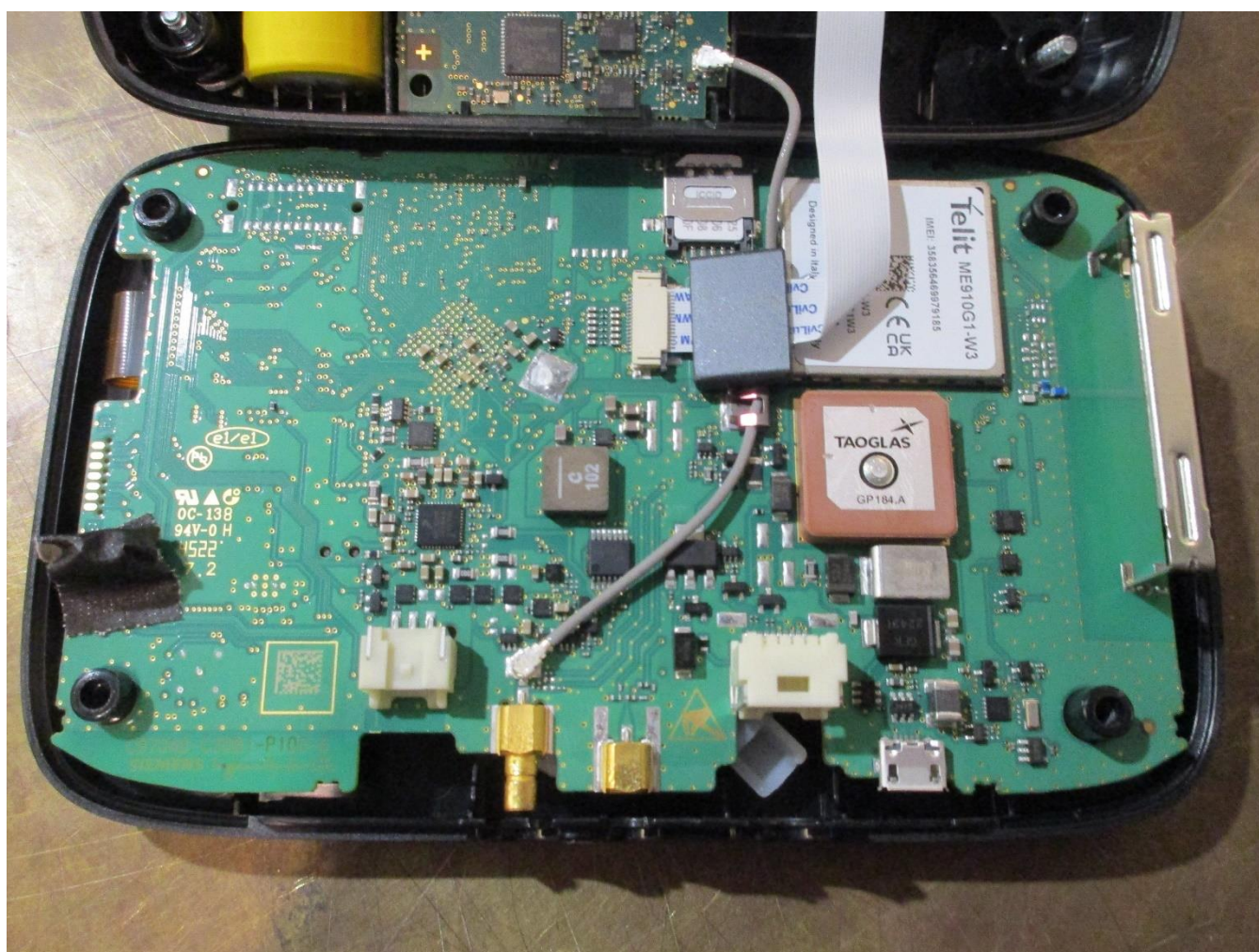
Division:
Industry & Energy

Description: Main PCB view #1

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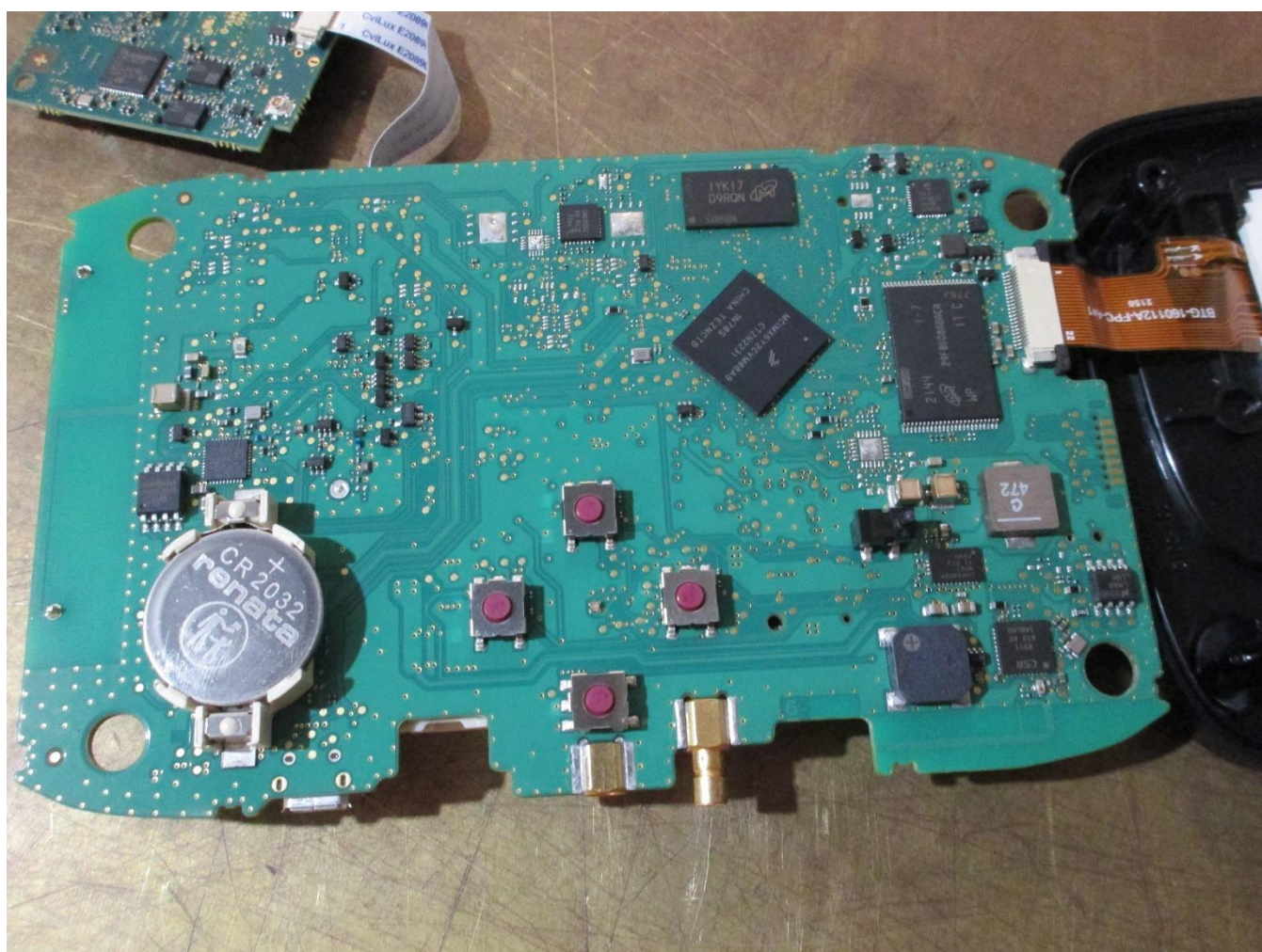
Division:
Industry & Energy

Description: Main PCB view #2

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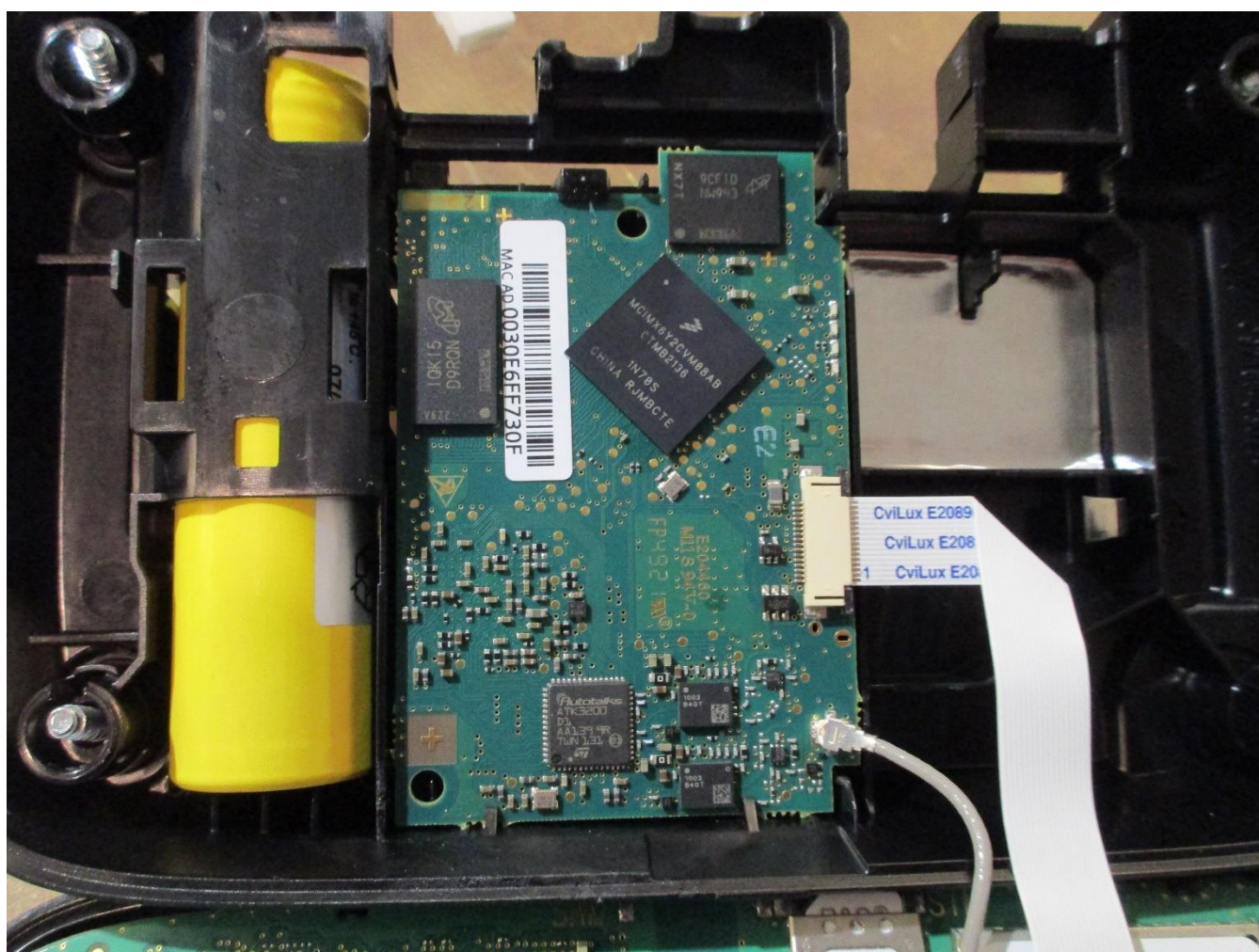
Division:
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Description: C-V2X PCB view #1

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Division:
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Description: C-V2X PCB view #2

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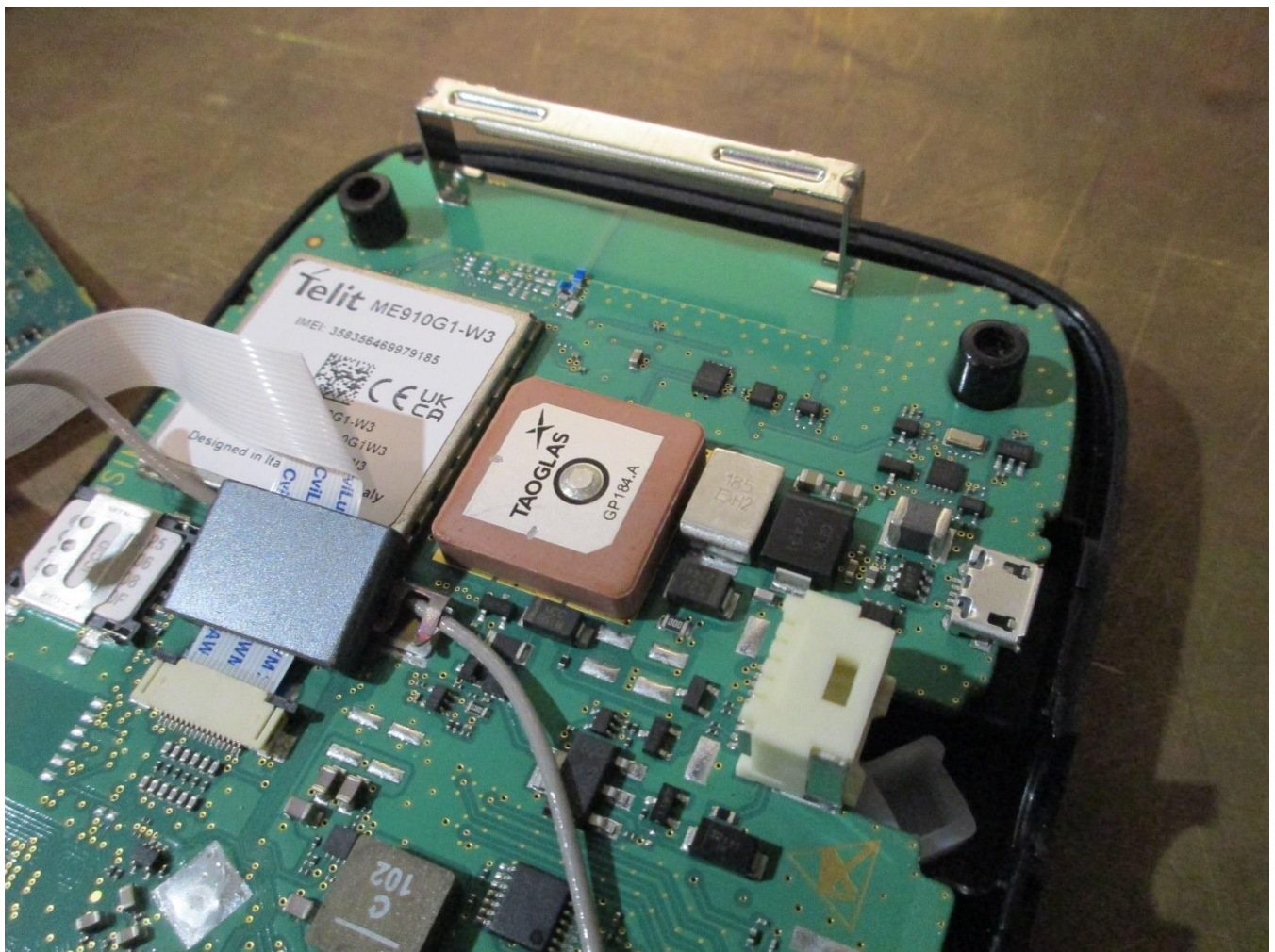
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Description: RF Part with GNSS and LTE Antenna

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Division:
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Description: LTE Antenna detail view

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Division:
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Description: C-V2X Antenna detail view

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Division:
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Description: Test setup 30 MHz - 1000 MHz

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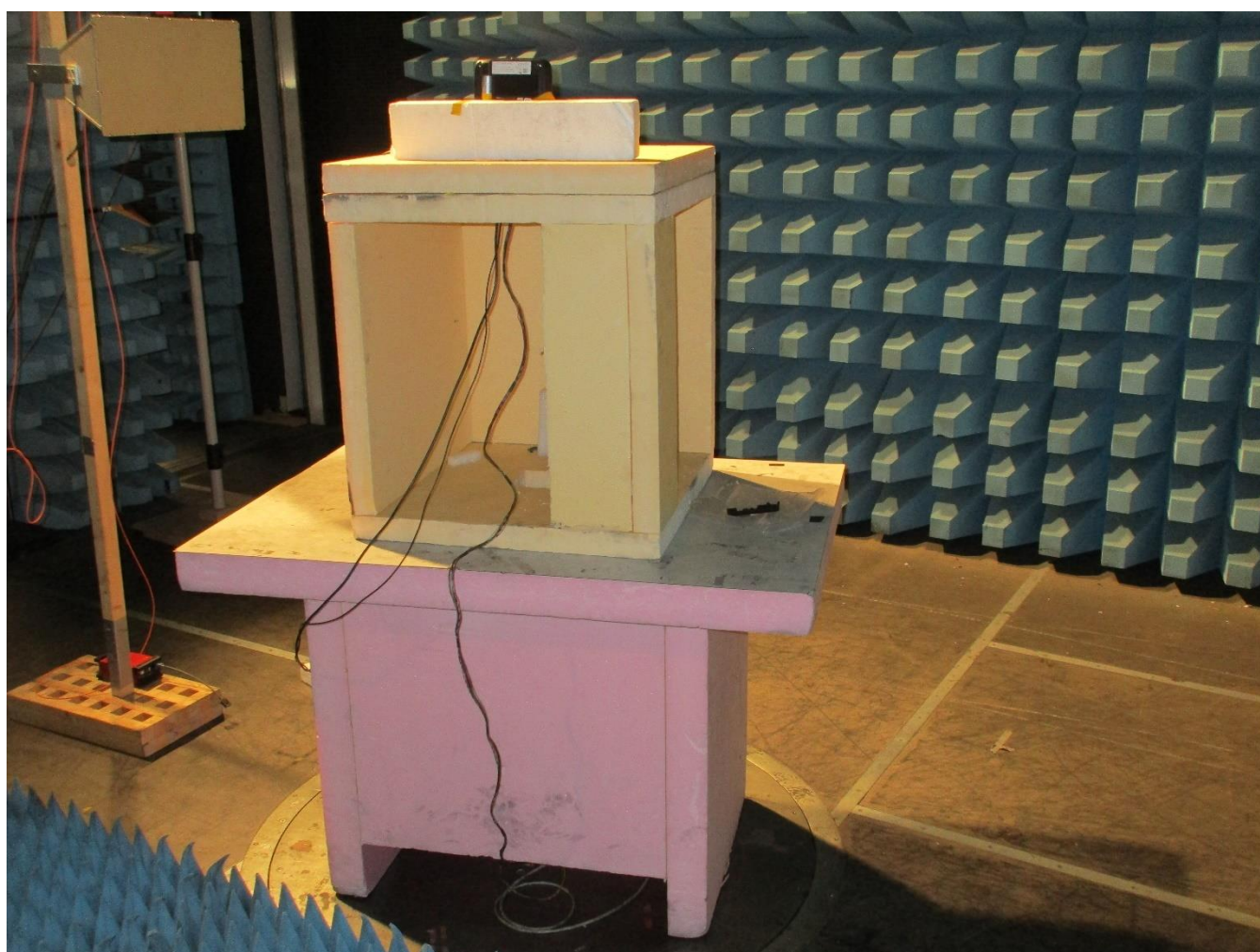
Division:
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Description: Test setup above 1 GHz view #1

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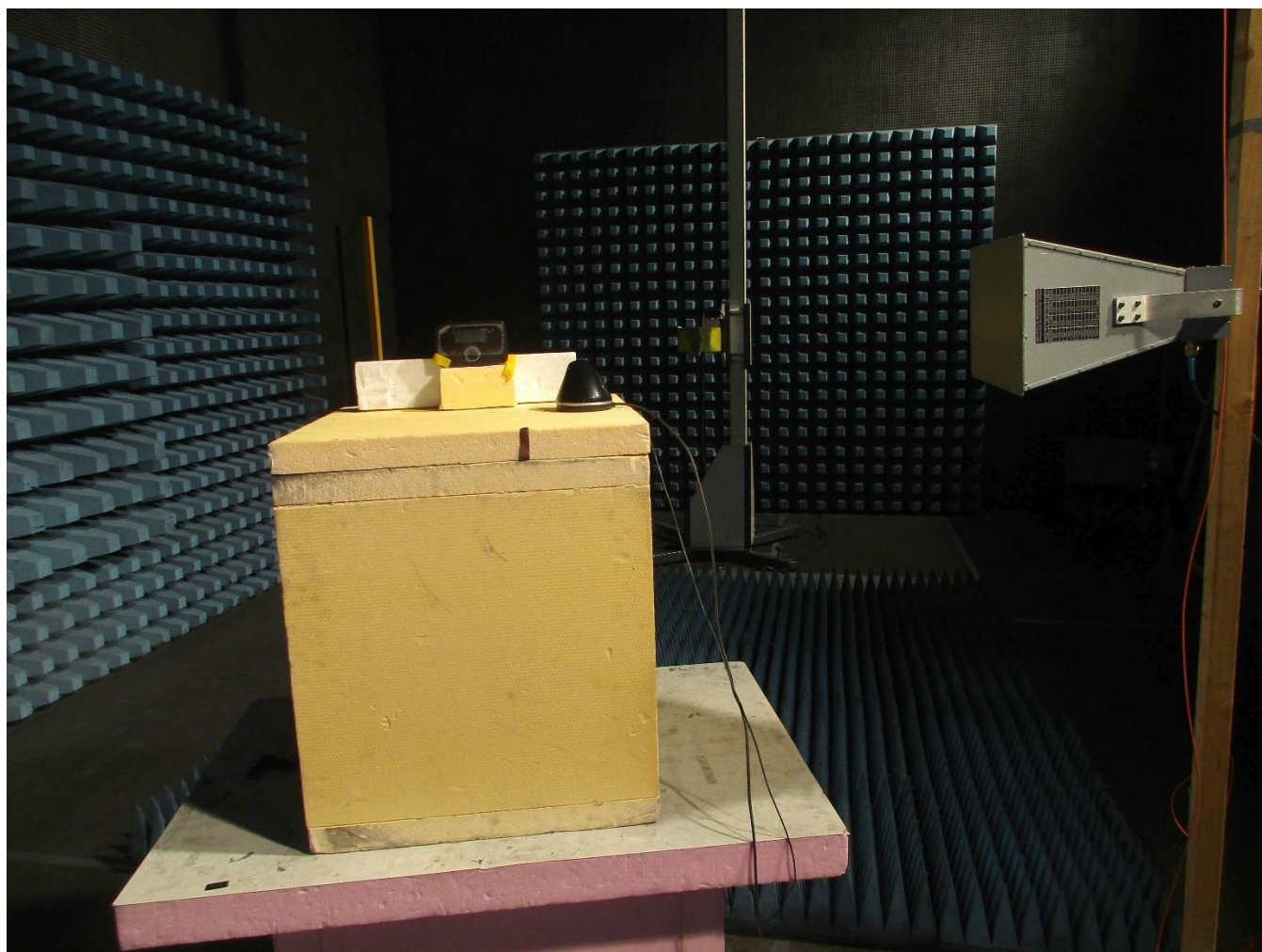
Division:
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Description: Test setup above 1 GHz view #2

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